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Available on loan from the CIA Library is a 92-page, English language, profusely illustrated 1950 Monograph of the Union Miniere du Haut-Katanga. The contents of this monograph are as follows:

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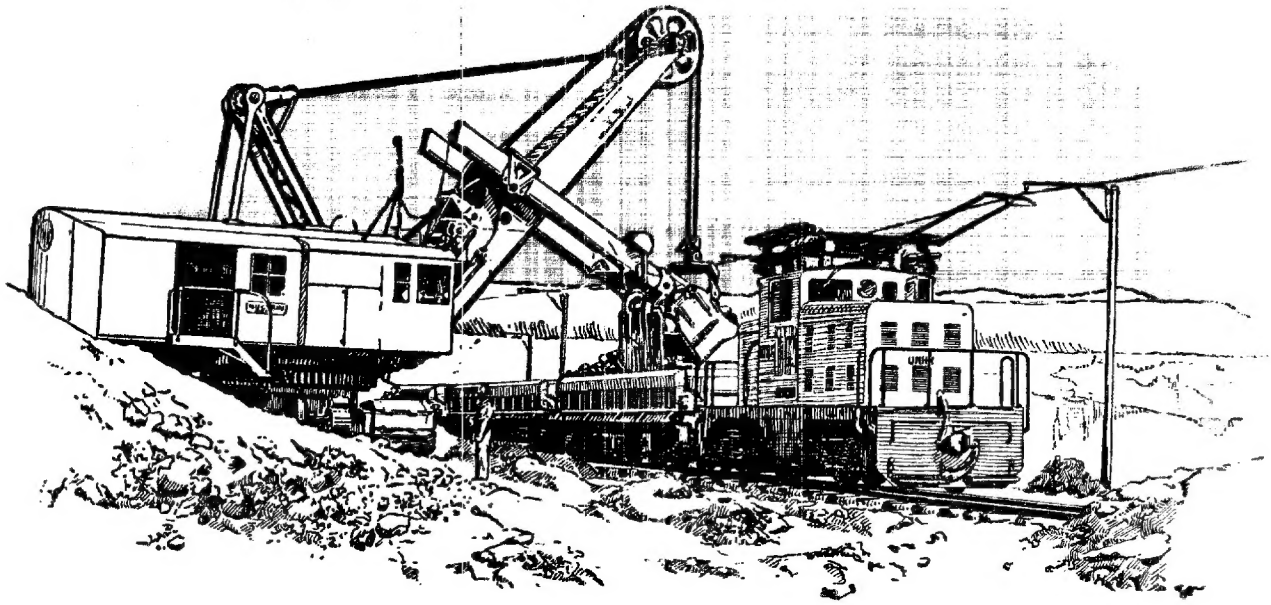
UNION MINIERE DU HAUT-KATANGA



MONOGRAPH

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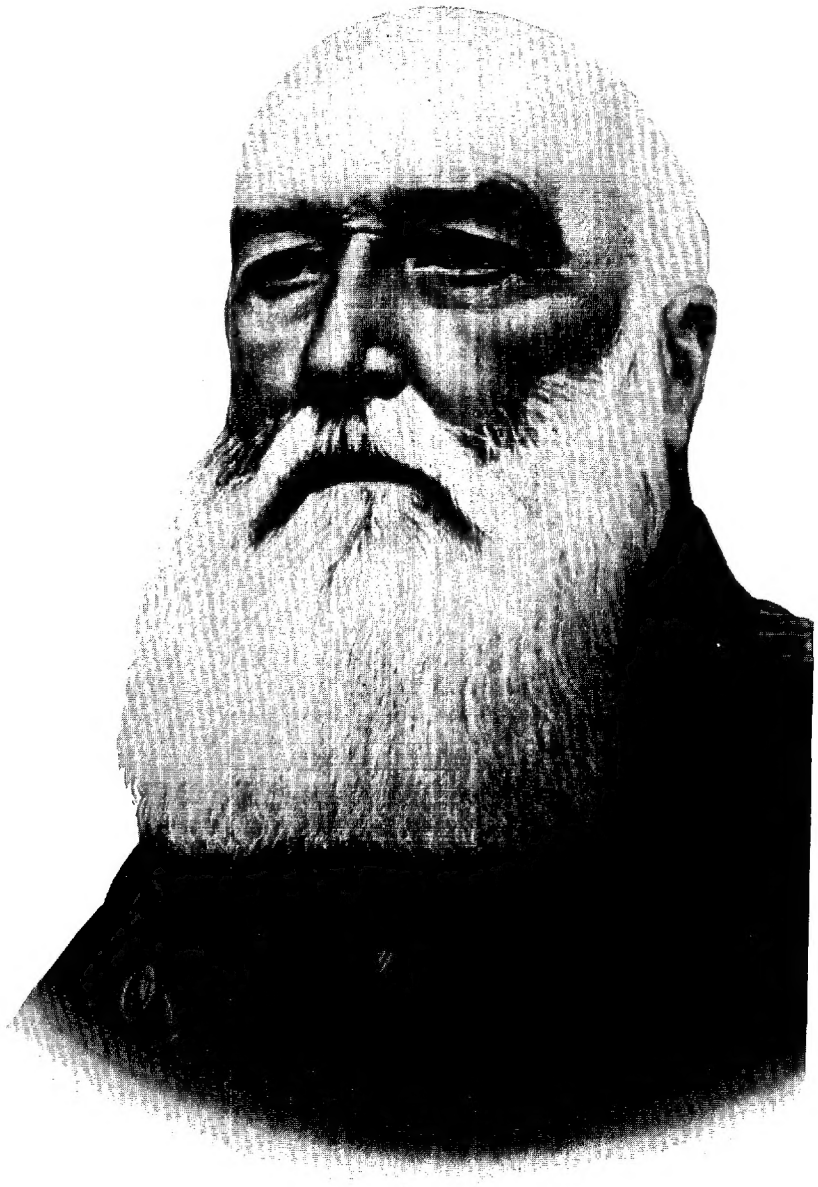

LEOPOLD II

Founder of the Congo Free State,
Initiator of the Industrialization of the Katanga.

UNION MINIERE
DU
HAUT-KATANGA

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Monograph
1950

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Part one

HISTORY

THE CONGO FREE STATE
THE BELGIAN CONGO

The creation of the Congo Free State through the persevering genius of Leopold II, King of the Belgians, and the energy of his colleagues, soldiers, explorers and the men of science is without doubt one of the most remarkable events of colonial expansion in the nineteenth century. The young king had a passion for geography. In his mind he had lived through the travels of Livingstone, Cameron, and Burton—those predecessors who had set out from the eastern coasts of Africa to discover the sources of the Nile.

"No students of geography," declared Stanley, "ever paid more attention to my letters published in the *Daily Telegraph*, to my book, to my lectures on Africa, than did King Leopold II." Among other things, Stanley's travels resulted in drawing the attention of the public to these unexplored regions.

Judging the moment opportune, the King on September 12, 1876 convened a geographical conference to the end of coordinating the efforts of the explorers and making Brussels the headquarters of the civilizing movement which he dreamed of undertaking.

Thus was created the "Association Internationale Africaine" (African International Association) which later became the "Association Internationale du Congo" (The International Association of the Congo). Under the driving impulse of the King, the Belgian section of this Association became outstanding, organized a number of expeditions and persevered in its work despite great difficulties.

Stanley, whose services the King had engaged, once again took the road to Africa in 1879. Five years later, more than forty settlements were founded on the banks of the Congo River and its tributaries by his colleagues, Cambier, Valcke, Hanssens, Van de Velde, Crespel, Liebrechts, Ramaeckers, Van Gele, Coquilhat, and still others, most of whom were Belgian army officers.

The Association's flag flew over these posts, so it became necessary to establish a political status for the vast territories controlled by this private organization. It was to this end that, in November 1884, an International Conference was held in Berlin.

After delicate negotiations resulting in the recognition, by all the European Powers, of the "Association Internationale" as a Free State, the Conference ended its work on February 26, 1885 by rendering homage to Leopold II, Sovereign of the new State.

Sir Edward Mallet, in the name of Great Britain, voiced the unanimous sentiment of the Assembly by declaring: "The part taken by the Government of Queen Victoria in recognizing the Asso-

ciation's flag as that of a friendly government, authorizes me to express the satisfaction with which we look forward to the constitution of this new State, thanks to the initiative of His Majesty the King of the Belgians. During long years, King Leopold II, motivated solely by philanthropic considerations, has spared neither personal effort nor financial sacrifice, in contributing to the realization of his plan."

The new State immediately embarked on its task, beginning with the freeing of the native population from the yoke of bands of trafficking Arabs led by Tippo-Tip and Rumaniza, who used to come to the Congo in search of slaves, robbing and killing all who resisted them.

After a long and arduous campaign, the Arab forces were finally annihilated at the end of 1893 by Belgian troops under the commands of Dhanis, Chaltin, Ponthier and Jacques.

Peace having been established, the government was then able to devote its time to the work of civilizing and educating the natives, which was Leopold II's plan from the very beginning. The State, very happily, strove to protect local customs where they were not objectionable, while at the same time, and with the aid of Catholic and Protestant missionaries, developing the education of the natives by establishing trade schools and model farms.

Sleeping sickness, typhus, and infant mortality, which were ravaging the population, were successfully conquered. At the same time, private enterprise, under control of the State, was opening up the country to commerce and industry. The first railroad, linking Matadi and Leopoldville, built by Colonel Thys, one of the King's colleagues, was inaugurated in 1898.

In 1908 the Free State ceded its sovereignty over the Congo to Belgium, from which the King had received financial aid in his work. The laws approving the treaty of assignment and covering the government of the Belgian Congo were signed October 18, 1908 by Leopold II, who died December 17, 1909.

King Albert, while Crown Prince, had already visited the Congo in 1908 and was to encourage the progress of the Colony just as Leopold II had done. Under the supervision of the Belgian government, the material and moral development of the Colony was increasingly furthered.

HENRY MORTON STANLEY
Colleague of Leopold II. His explorations in the heart of Africa opened this region to civilization.

The devotion and faithfulness of the natives towards their Belgian protectors were evidenced in the first World War, when colored Congolese troops, under the command of Belgian officers, played a victorious part in the Cameroun and East African campaigns, and while the country was drained of its police forces, it remained peaceful and contributed to the victory of the Allies by an ever increasing production.

During the last war, the Congo with its 2,800 miles of railroads, its 8,600 miles of navigable streams, its remarkable network of roads and numerous airfields, once again played an important rôle among the United Nations. Its troops participated in campaigns side by side with British Imperial Forces. Its mines and metal plants provided the essential raw materials for war industries in Great Britain and the United States, and lastly, its agricultural products contributed to the feeding of East Africa. The material prosperity and the moral progress of the natives under Belgian guidance astonish the observer, not only in the urban and industrial centers but also in the most distant corners of the equatorial forest.

THE SETTLING OF THE KATANGA AND THE FOUNDING OF UNION MINIERE DU HAUT KATANGA

Because of its distance from the Atlantic coast, from which the original Belgian penetration took place, the Katanga was of necessity one of the last regions taken over by the forces of the Free State.

The first drive against slavery, which had taken place in the northern part of the province, had moreover delayed occupation of the southeastern borders of the Katanga.

Nevertheless, the mineral wealth of this region, which owes its name to a native chief who ruled the tribes living between the Lualaba and the Luapala, was already common knowledge through the records of Livingstone and several other explorers.

As early as 1889, therefore, the King once again appealed to those businessmen who, from the very start, had given him their support.

The " Compagnie du Congo pour le Commerce et l'Industrie " (C. C. C. I.) quickly organized an expedition under the command of Alexandre Delcommune with the main object of exploring the Katanga from a scientific and commercial point of view. This expedition left Leopoldville in October 1890, arriving at the end of November at Bena-Kamba, furthest navigable point on the Lomami.

For its part, the Free State appointed Lieutenant Paul Le Marinel, Commissioner of the Kasai District, as leader of an expedition into the Katanga to ensure effective occupation of this province. In April 1891, Le Marinel established himself on the Lofoi River, 31 miles from Bunkeya, residence of Chief Msiri, successor to Chief Katanga. In the meantime, the C. C. C. I. on April 15, 1891 created a subsidiary, the Compagnie du Katanga, the object of which was to explore the basin of the Haut-Congo to study colonization possibilities, agriculture and mining, to establish means of communication by land and water, and to form companies for the development of agriculture and mining in the explored regions.

From its very inception, the Compagnie du Katanga took over the Delcommune expedition and then organized the Stairs-Bodson and Bia-Francqui expeditions. These explored the Katanga and concluded treaties with native chiefs. Cornet, the geologist and a member of the Bia-Francqui expedition, was able to conduct the first scientific geological study of the Katanga.

The political occupation of the territory was thus achieved and with it, the submission of the principal native chiefs.

Through an agreement dated March 12, 1891, the State granted the Compagnie du Katanga, in exchange for its cooperation, large concessions determined in advance on the map but the limits of which it was not practically possible to determine. It was not until 1900 that a definite solution was arrived at by the formation of the Comité Spécial du Katanga in which the Compagnie du Katanga and the government of the Colony vested their rights in this province with the object of capitalizing them and sharing the profits in proportion to their respective original contributions.

While building roads and studying agricultural possibilities in the region, the Comité made a special effort to hasten recognition of the mineral riches, the existence of which had been established by Cornet's work.

To this end, the Comité on December 8, 1900 granted Sir Robert Williams, an English engineer, and Tanganyika Concessions Ltd., prospecting rights in the South-Katanga mining regions. This marked the beginning of a cordial and fruitful partnership between businessmen and Belgian and British engineers, which was destined to bring about the formation of Union Minière du Haut Katanga on October 30, 1906, thanks to the formulated action of the Société Générale de Belgique with Jean Jadot, on the one hand, and of the Tanganyika Concessions Ltd. with Sir Robert Williams on the other.

This company was incorporated as a Congolese company with an initial capital of 10 million francs, which was progressively increased to 3 billion francs.

At its inception, Union Minière received the right to mine, up to March 11, 1990, all the copper deposits located in a 7,700 square mile concession, as well as all the tin deposits existing in an adjoining concession covering about 5,400 square miles.

Cobalt, as well as silver, gold and zinc, are associated with the copper and are mined with it.

Certain copper deposits also contain cadmium and precious metals. In addition, an uranium and radium deposit discovered by the company's prospectors has been worked since 1922.

Lastly, the company holds concessions covering iron, coal, limestone and other mineral deposits useful in the processing of ores, and also rights to waterfalls for the production of power.

JEAN JADOT
of the Société Générale de Belgique

ROBERT WILLIAMS
of the Tanganyika Concessions Ltd

Respectively
former President and Vice-President
and joint founders of Union Minière du Haut-Katanga,
entrusted with the working of the copper concessions
granted to it by the Comité Spécial du Katanga.

ACTIVITIES OF UNION MINIERE AND SUBSIDIARY COMPANIES

Union Minière is a very large enterprise. Its numerous activities cover a great many fields and have necessitated the investment of capital amounting to several billion francs.

In their present state of development, the Union Minière mining operations are concentrated in the Kipushi, Kolwezi, Musonoi, Ruwe, Kamoto, Lukuni, Luiswishi and Kalabi mines.

The ores are processed at the Jadotville, Kipushi or Kolwezi concentrators, from which the concentrates then move to the Lubumbashi or Jadotville plants. A description of these installations will be covered in the second part of this monograph.

In order to meet the multiple needs of its industry, Union Minière has formed a certain number of subsidiary companies which, while having their own activities, contribute to the realization of the overall objective aimed at by the group.

These activities consist of :

— Hydro-Electric Power Plants : Société Générale des Forces Hydro-Electriques du Katanga (Sogefor);
— Power Distribution : Société Générale Africaine d'Electricité (Sogelec);
— Chemical Plants : Société Générale Industrielle et Chimique du Katanga (Sogechim);
— Coal Mines : Charbonnages de la Luena;
— Flour Mills : Minoteries du Katanga;
— Explosives Plants : Société Africaine d'Explosifs (Afridex).

The above set up permits Union Minière to devote its time exclusively to the production of non-ferrous metals.

A description of the activities of these subsidiary companies is covered at the end of this monograph.

In addition to the above, Union Minière has also acquired an interest in the following companies :

— Société de Recherche Minière du Sud-Katanga, which conducts explorations in areas adjacent to those granted to Union Minière;
— Compagnie Foncière du Katanga, whose function is the construction and management of housing for the Europeans;
— Chemin de Fer du Katanga (Katanga Railroad).

Lastly, Union Minière has taken a major participation in the Société Métallurgique du Katanga (Metalkat), which is charged with the construction and operation of a zinc refinery for the treatment of concentrates produced by Union Minière.

UNION MINIERE AND BELGIAN INDUSTRY

Through its controlling interest in Société Générale Métallurgique de Hoboken, to which it delivers almost its entire output exported in the form of crude products, Union Minière has largely developed the field of Belgian industrial activity. The Hoboken and Oolen plants, a more detailed description of which follows later, have in a way become an extension of Union Minière's African installations. The following products are treated :

Blister copper, at the Oolen Electrolytic Refinery;

View of the Oolen works of the Société Générale Métallurgique de Hoboken. These plants refine the copper shipped from Africa by Union Minière.

Cobalt alloys, at the Oolen chemical plant;

Leaching residues containing precious metals, at the " Precious Metals " Division of the Hoboken plant;

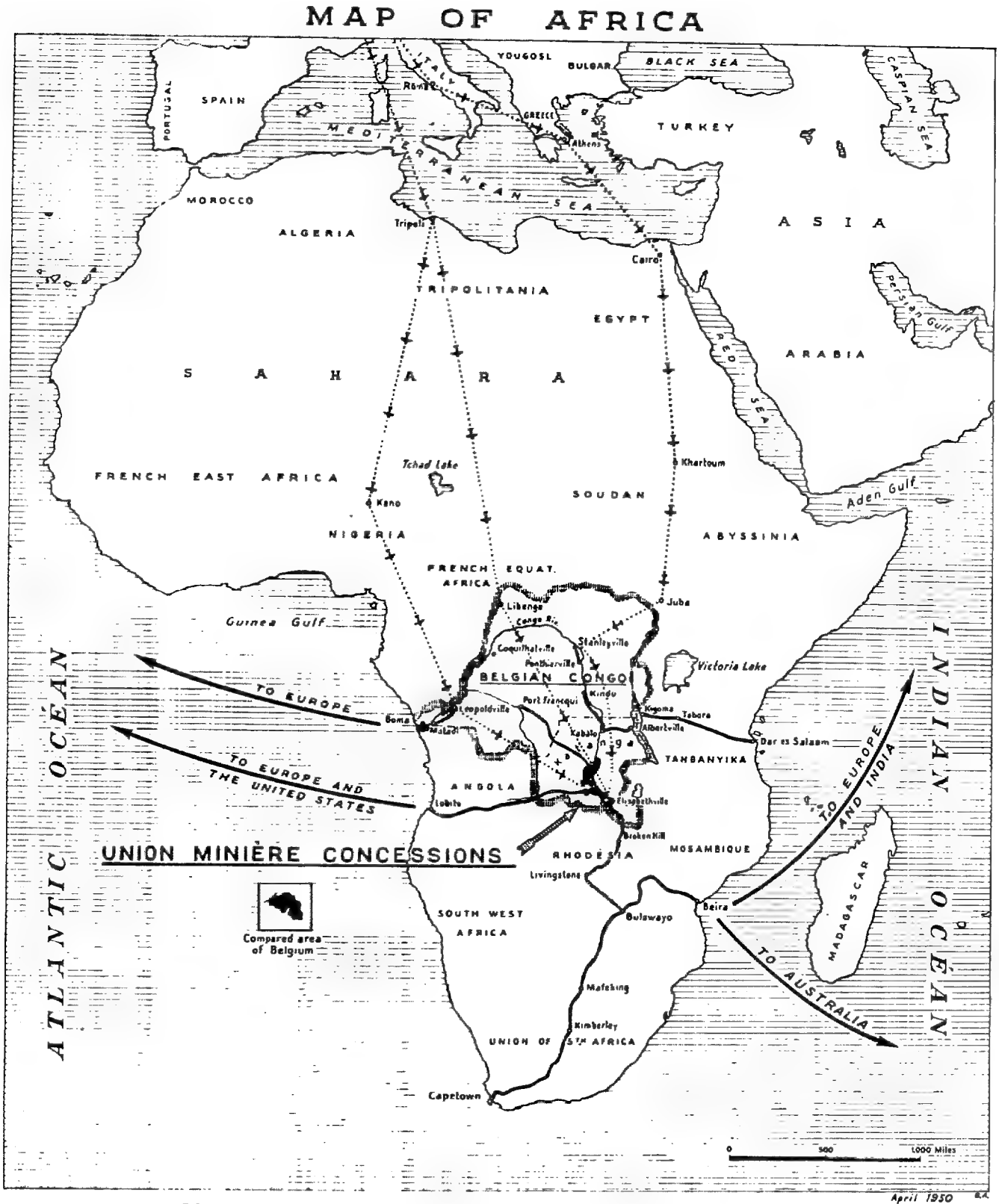
Radium ores, at the Oolen plant.

The transformation of these products represents an important part of the activities of these plants and has largely contributed towards assuring their expansion and towards extending their reputation far and wide.

The aggregate of these installations employs a personnel consisting of about 100 engineers and 4,000 workmen. It is one of the largest industrial organizations in the country.

SUPPLIES OF ZINC CONCENTRATES TO BELGIAN ZING INDUSTRY

Since the end of the war, Union Minière has contributed in large measure to the supply of ores for this industry, which for years has constituted the principal livelihood of a great many Belgian workers. Thanks to this valuable support and while having lost a good number of its pre-war suppliers, this key industry has been able to regain a degree of activity almost equal to that existing before the war, and thus to contribute to the splendid recovery effort which today enables Belgium to occupy an envious position in Europe and throughout the entire world.



Situation of Union Minière Concessions.

THE KATANGA TODAY

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ACCESS TO THE KATANGA

To the previously existing overland routes to the Katanga, viz. the *Matadi-Elisabethville* route, the Angola Railroad's *Lobito-Elisabethville* route, and the South-African *Cape-Elisabethville* rail route, have been added two direct air routes, i.e. *Brussels-Leopoldville-Elisabethville*, and the *Brussels-Rome-Athens-Cairo-Stanleyville-Elisabethville* tourist route.

Elisabethville is actually only two days direct flight from the Belgian capital. Elisabethville is linked by direct and regular air service to all the main centers of the Belgian Congo and with South Africa.

TOPOGRAPHY AND CLIMATE OF THE KATANGA

Since the administrative division of the Colony into six provinces, the former province of Katanga has been divided into two provinces, one of which constitutes the present province of Katanga. The Union Minière concessions are in this province.

From a geographic and climatic standpoint, the Katanga is divided into two regions, the "Bas Katanga," which is the tropical part, situated north of the 10th parallel, and the "Haut Katanga," the temperate part, located between the latter parallel and the southern border.

The great mining and metallurgical industry, described in the pages which follow, is situated in the Haut Katanga.

The mining region consists of a series of plateaus separated by valleys, such as those of the Luapula, the Kafubu, the Lufira, the Dikuluwe, the Lualaba and the Musonoi

The terrain is mostly undulating though mountainous in parts. On the whole, it is covered by level forests in which trees 50 to 65 feet tall may sometimes be seen. Here and there in the middle of the forest, there are vast marshy clearings called "dembos".

The altitude of the Haut Katanga varies between 3,600 and 5,500 feet. Thanks to this, the country, in spite of its proximity to the equator, enjoys a temperate climate.

There are but two seasons in the year: the rainy season, lasting from the end of October to mid-April, and the dry season, during the balance of the year. The weather is cooler during the dry season. During this season, the nights are cold and occasionally the thermometer even registers 32° Fahrenheit. During the day, the temperature is pleasant all the year round and causes no discomfort to Europeans. The white workers, masons, and carpenters, for example, work without discomfort under a bright sun. The average temperature during the day varies between 65° F and 86° F. Neither the health nor the energy of the whites are affected.

The Katanga may therefore be considered a healthy country where Europeans can settle on condition, of course, that certain precautions are taken, such as the use of boiled water where no drinking water is available, anti-typhoid vaccination, the use of mosquito netting over beds, and regular doses of quinine as a preventative against malaria.

Malarial fever, caused by the sting of the "anophele" mosquito, is the only tropical disease against which one has to be protected in the Katanga. A systematic fight is being waged against insects spreading this disease and there is great hope of completely eliminating them from the inhabited areas of the Katanga.

ECONOMIC CONDITIONS

AGRICULTURE - LIVESTOCK BREEDING

If, under the present system of communications, the great distances separating the Katanga from the seacoasts do not permit the export of agricultural products, the industrial development of the country, on the other hand, provides an important local outlet for these agricultural and livestock products. The 15,000 or so Europeans and the tens of thousands of natives who actually live in the industrial Haut Katanga require cereals, vegetables, fruits, eggs, chickens, milk, butter, meat, etc. These edibles are furnished for the most part by European agricultural enterprises established in the region. Natives living near Elisabethville and Jadotville also operate truck-gardens and supply part of the vegetables consumed by the Europeans.

The Katanga possesses fertile soils but they are scattered and must be searched for and uncovered. Sometimes, lands suitable for cultivation are wooded and it is then necessary to clear them and remove the tree stumps, which is very costly.

In the regions free of tsetse flies, which is the case for Elisabethville and its neighborhood as well as for all the neighboring country of the Biano plateau, agricultural work is performed with the aid of oxen. In other parts, recourse must be had to mechanical equipment.

VARIOUS INDUSTRIES

In addition to the industries previously mentioned, and which contribute directly to its activity, the development of Union Minière has brought about the creation of a number of independent industries.

A cement factory (Lubudi) and a calcium-carbide plant produce quality products from which the general economy of the country derives great benefit.

A brewery (Elisabethville) produces greatly appreciated beer and table water which are sold throughout the entire eastern part of the Colony.

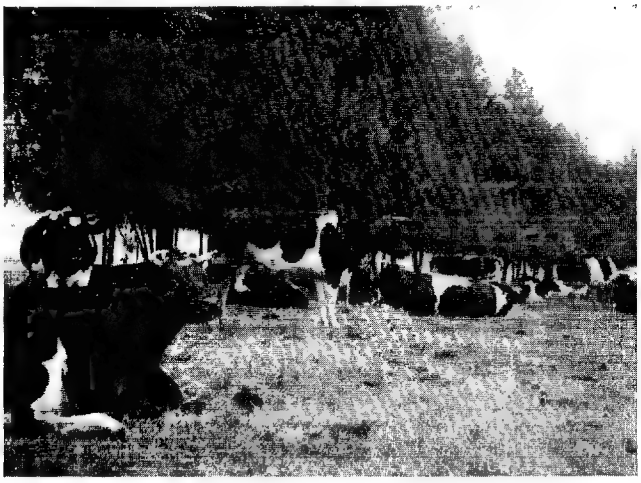
Oil plants (peanut, corn, cotton, sesame), soap and candle works use the commodities abundantly cultivated or harvested by the natives in neighboring regions.

Mills produce corn and cassava flour, far superior in quality to the native products, and wheat flour from the cultivation of the lands in Ruanda-Urundi. The Comité Spécial du Katanga has installed a modern dairy farm which treats a large part of the milk produced on the numerous farms established around Elisabethville. This dairy farm supplies the population with pasteurized milk, butter, cream, cheese, etc. Salt works are operated at Guba in proximity to the C. F. K. Railroad and virtually assure the Haut Katanga of its entire requirements of salt.

Fisheries installed on the Luapula and at Lake Moero supply the Europeans and natives with fresh and smoked fish. Ice, soft-drink and sparkling water plants find a sufficiently large clientele to enable their business to prosper. Many carpenter's and cabinetmakers' workshops, machine shops, coppersmithing works, plumbing works, wire mills, nickel works, and tire vulcanizing establishments are owned by small businessmen and enjoy a good turnover through the orders which they receive from private customers and large companies.

A few very prosperous printing establishments are especially favored by large local enterprises.

A large cigarette factory has been opened, thanks to the fact that its raw materials are furnished in part by local tobacco farms.



C. S. K. experimental farm—A flock of cattle. The Katanga enjoys a healthy climate. With the exercise of certain precautions, Europeans are protected against tropical diseases. Agriculture and breeding thrive normally.

LOCAL BUSINESS — CONTRACTORS

The operation of the mines in the Katanga, which represents the principal source of wealth in that region, has fostered the development of local enterprises, already of considerable size, which are sufficiently large to assure the needs of the white and black populations of industrial Katanga, numbering more than 1,200,000.

The Union Minière alone sets aside 250,000,000 francs each year for its local purchases. Considering the approximately 210,000,000 francs which

The Katanga Railroad is the main channel of the country's mining economy; it transports the ore and concentrates between the mines and plants and forwards the products to foreign markets.

the company annually pays its African personnel for services, which sum for the most part is spent on the spot, it is readily apparent that the direct purchasing power of Union Minière and its personnel of itself constitutes an important market for the commerce of the Haut Katanga.

On the other hand, a great deal of work, such as the development of small mines and quarries, building construction, wood cutting, road transportation, etc., is given to local enterprises. The total amount paid for these services in an average business year is some 85,000,000 francs.

EXPORTS

The above activities have been made possible, thanks to the expansion undertaken by the large mining industry which is the mainstay of the Katanga economy. The mining industry, itself handicapped by the enormous distance over which its products must travel to reach the markets, depends entirely upon low transportation costs.

The principal artery of the country's economy consists of the Katanga Railroad, which transports the ores and concentrates between mines and plants and which connects with three principal means of egress for the export products as follows: the main line, by rail and river, which links the Katanga to the port of Matadi—the Benguela Railway which crosses Portuguese territory throughout its entire length to the port of Lobito—and the Rhodesia Railway which goes to Beira on the east coast of Africa. Arriving at these ports, these Katanga products find many Belgian and foreign ships to transport them to their countries of destination.

PRINCIPAL CENTERS

The settling of the Katanga by white pioneers dates back to 1910. Elisabethville was founded at that time. Opening up of the Etoile du Congo copper mine and construction of the Lubumbashi smelter were just getting under way at this same time.

The extension of the railroad to Kambove in 1913 and the opening of a large mine at that spot gave birth to another settlement. Thereafter, extension of the rail network, the opening up of new mines and the creation of various industries resulted in the rise of other centers such as Jadotville, Kipushi, Lubudi, Bukama, Luena, and Kolwezi.

The province of Katanga at the end of 1949, had about 15,600 European inhabitants, of whom more than 7,000 are permanently located in Elisabethville, capital of the province. General Wangermee, first governor of the Katanga was the one who chose the location of this city.

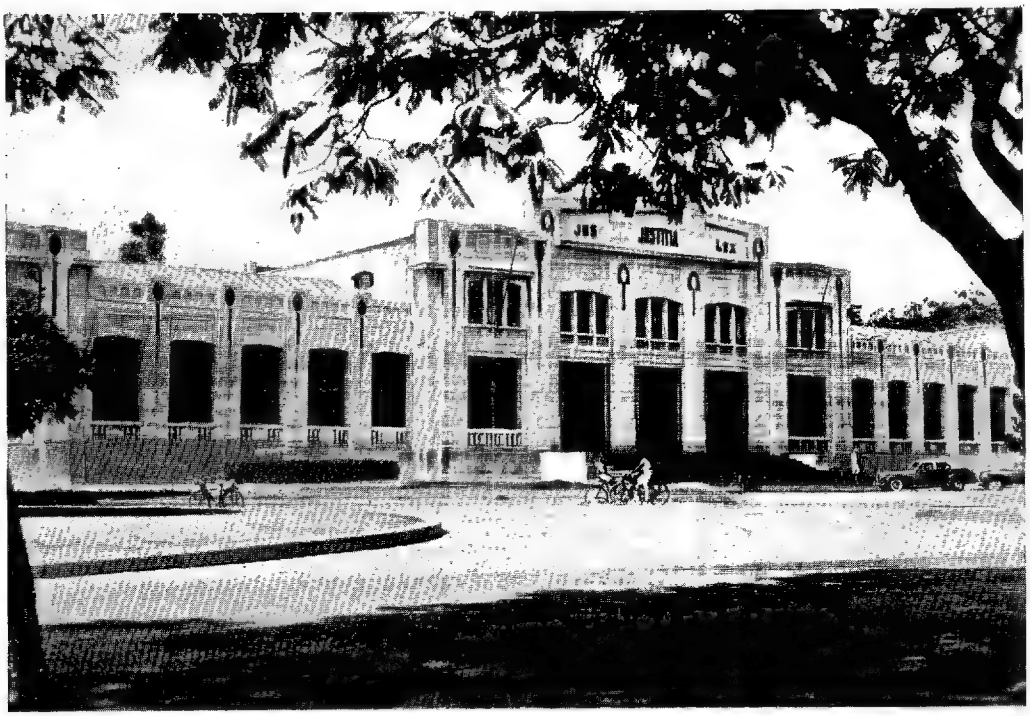
He stopped on a slightly hilly plateau situated near the Lubumbashi River.

In a few months' time, thousands of trees were felled and hundreds of termite hills were cleared to make room for wide avenues which divide the city in squares and rectangles, giving it the aspect of an American city.

The center of the city is occupied by industrial and business offices, while the outskirts are attractively grouped with pleasant residential homes surrounded by gay gardens where European flowers blend harmoniously with tropical plants.

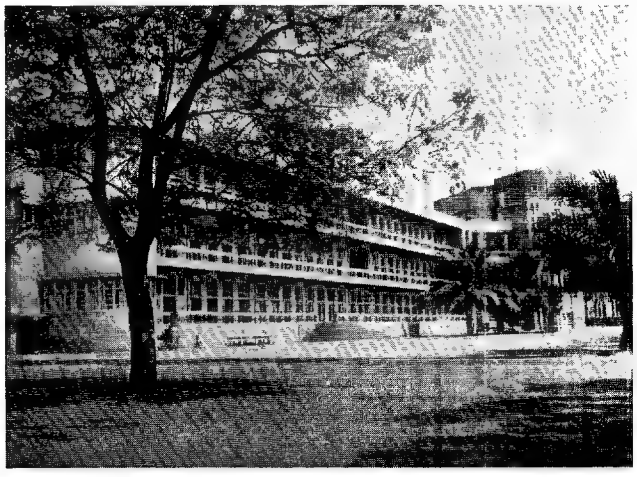
Upon leaving the railroad station, one proceeds along a wide avenue at the end of which rises a monument erected to the memory of King Albert.

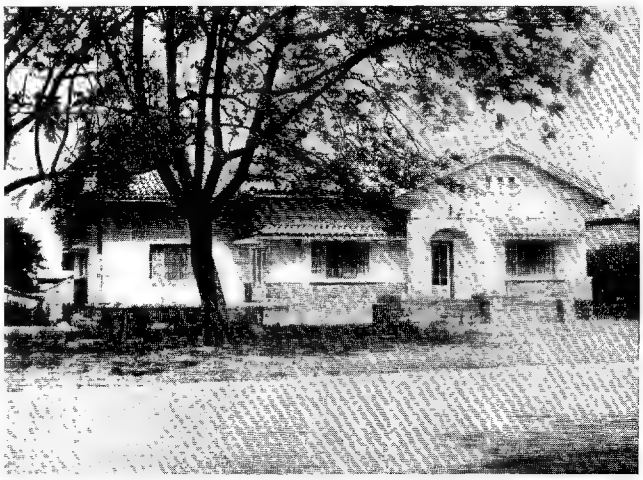
Passing by the Post Office building, one crosses the Place Albert I, a busy section at all hours of the day and night, to reach the Place Royale, around which are grouped the Palace of Justice, the Cercle Royal Albert-Elisabeth and the Municipal Offices. In one of the small gardens of the Place Royale is a monument dedicated to General Wangermee.



Elisabethville Law Courts.

There are many schools in the Katanga where European children can complete their junior studies. Hereunder, is the Marie-José Institute for white girls, maintained at Elisabethville by the Sisters of Charity of Ghent.





Company house located in a residential section of Elisabethville.

Not far from there is the cathedral, a beautiful edifice in Roman-Byzantine style. A little to the north of the Place Royale are grouped, around an attractive public park, the Marie-José Institute, run by the Sisters of Charity of Ghent, and St. Francis de Sales College, run by the Salesian Fathers, a grammar school and a junior school, the former for girls, the latter for boys, the European hospital, a nursery and a convent for the Sisters.

In the new quarter east of Winston Churchill Avenue are the new buildings of a third school, the Athénée Royal, which consists of ward sections, primary and junior, for girls and boys. Boarding schools form a part of the three school buildings and they follow the same school curriculum as in Belgium.

Situated on the boulevard which borders the city to the west is the residence of the governor of the province, from which there is a magnificent view of the valley of the Lubumbashi River and of Union Minière's plants. The new General Administrative Offices of the company are also located on the boulevard, close to the avenue leading to the Lubumbashi plant.

To the south of the city are located the army camp and the native city, where the government and the missions have erected a model hospital, schools, a church and a large sports stadium with a bicycle racing track which was inaugurated in 1942.

There is no lack of sports facilities : tennis, sports fields, swimming pools, golf course, hippodrome, etc., both inside the city and out. The Victory Stadium is situated on the outskirts of the city along Winston Churchill Avenue and already includes football fields, hockey and basketball facilities and eventually, tennis courts, a swimming pool and other sports facilities.

On the road to Jadotville, three miles outside the city, there is an airport capable of accommodating the most modern airliners.

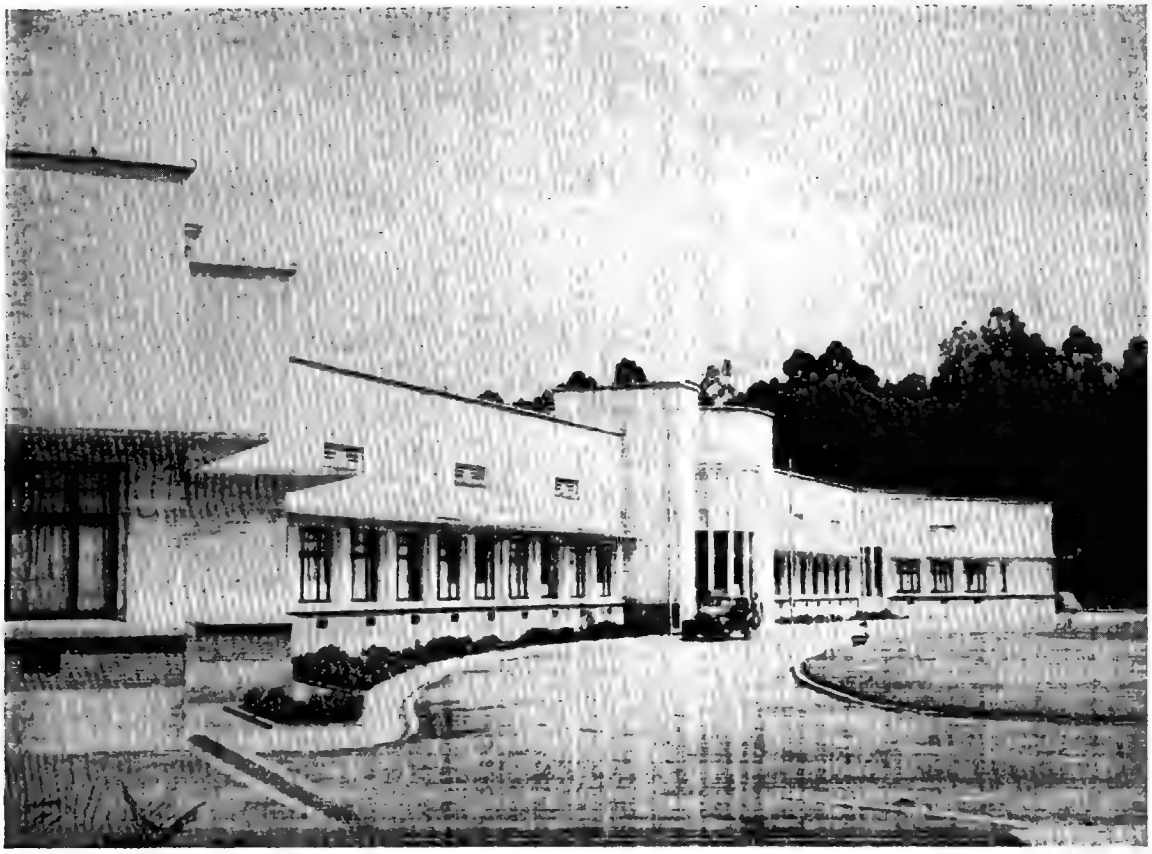
Roads, within a radius of twelve miles from the city, lead to numerous farms and rustic country spots loved by the excursion-minded.

Lying 87 miles to the northwest of Elisabethville is Jadotville, large Union Minière site, resulting from the amalgamation of nearby Panda and Likasi, capital of the district of Lualaba. It derives its name in memory of Jean Jadot, former Governor of the Société Générale de Belgique, founder and Chairman of the Board of Union Minière.

Created about 1917 soon after the opening of

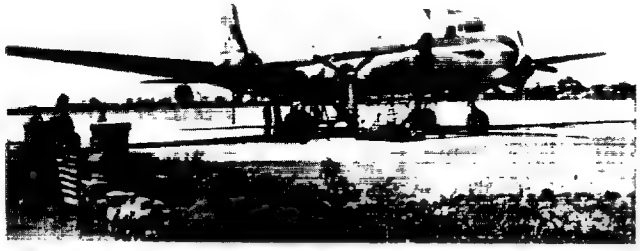
Elisabethville - A holiday. Built on a hilly plateau, Elisabethville, with its wide avenues dividing it into squares and rectangles, resembles American cities.

Boulevard Elisabeth at Elisabethville. New buildings are constantly being added to those already in existence. Katanga cities are developing rapidly.



Union Minière's Administrative Offices in Elisabethville.

Many sports facilities in the Katanga enable Europeans to practice their favorite sports. The Victory Stadium at Elisabethville, shown above, includes football, hockey, and basketball fields.



The Elisabethville Airport, located 3 miles from the city, is the terminal of several airlines, one of which links the Katanga with Brussels.

the Likasi copper mine, the locality at first had little success but with the start of operations at the Panda concentrator, which attracted the first influx of settlers, this region in 1921 acquired a certain importance. Finally in 1928-1929, under the impetus of the industrial development of Panda, the settlement increased considerably to its present population of 3,000 Europeans.

The business section of the city includes office buildings, banks, stores, and a railroad station, all of which vie with the most beautiful buildings of the provincial capital.

The new Athénée Royal and the Xaverian Brothers boys' school are located in the old town of Likasi while the girls' school run by the Benedictine Mothers is located in Panda.

The Jadotville region being much hillier than that of Elisabethville is by the same token more picturesque. The road to Elisabethville crosses the Lufira River, the Sunday rendez-vous of anglers and picnickers. A trip to the Cornet Falls at Mwadingusha, where the Lufira drops 360 feets in two cataracts, is a regular excursion spot. Trips to Mulungwishi, Kambove and Shangulowe also afford a beautiful view extending to the Biano plateau.

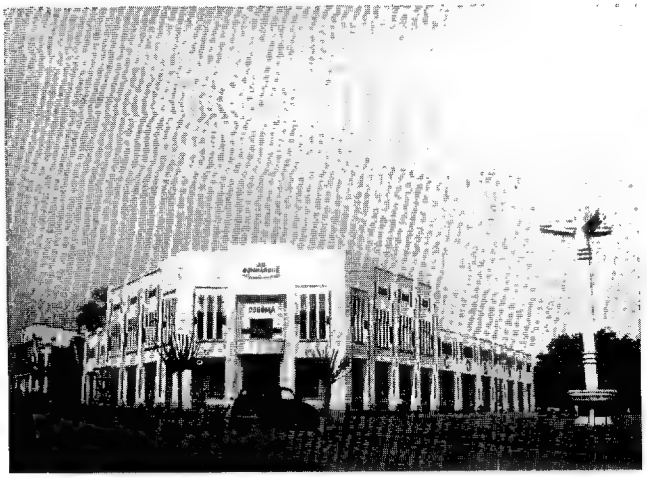
Kipushi is a mining village of some 600 Europeans, most of whom work at Union Minière. The commercial development of this center has been limited due to the fact that the people prefer to do their shopping in Elisabethville, a short distance of 17 miles.

The sports facilities, while more modest than those of larger centers, are no less popular with the football, hockey, swimming, and tennis fans.

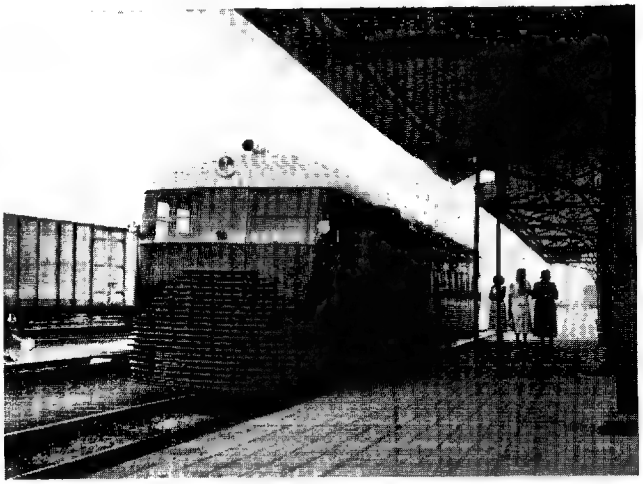
Kipushi has a public grammar school.

Jadotville-Panda : The Church.

Kolwezi, a fourth center, located along the Tenke-Dilolo Railroad in the mining region of



A large department store at Jadotville. " Le Bon Marché ".



Elisabethville is linked to Jadotville, the principal metallurgical center of the province 87 miles away, by a Diesel rail-car service.

the west, was created in 1938 and is destined to become an important town.

The mapping out of this locality has been well conceived through the experience acquired in other towns.

Completely modern hospitals for Europeans and natives are maintained. The " Compagnie Foncière du Katanga " is building a comfortable hotel, and a religious order known as the Dames Chanoinesses de Saint-Augustin, who arrived from Belgium in 1940, has founded a boarding school for girls, which compares with some of the best in Belgium. A college under the direction of the Franciscan Fathers has just been established and there is question of soon building an Athénée Royal.

Kolwezi, situated in the center of the Western mining region on the Tenke-Dilolo rail line, has greatly benefited from the experience gained through the improvement of other centers. It was designed according to carefully studied plans. Shown hereunder, is the hospital for Europeans.

Kolwezi. Our Lady of Lights. School for European children.

In a few years, as the mining industry of this region develops, there is no doubt that Kolwezi will become a tourist center, especially when it is considered that not very far from there are the famous Zilo Falls at which point the Lualaba River levels out from a height of 296 feet in a series of rapids which are spectacular owing to the large flow. It is at this spot that the Delcommune Dam and power plant, begun in 1949, will be built to complete the hydroelectric power requirements of the Katanga.

The mining industry, and especially the copper industry, has thus, in the space of a few years, transformed into a prosperous region, a country which fifty years ago did not even appear on the map and which, having already attained a considerable degree of development, holds promise of a future which justifies all the labor and sacrifice expended on it by the Belgians.

Kolwezi : View of the "Hôtel de la Manika".

Part two

UNION MINIÈRE OPERATIONS IN THE KATANGA

I. GENERAL

The geology of the Katanga was first studied in 1892 by Professor Jules Cornet, a member of the Bia-Francqui expedition organized by the Compagnie du Katanga and who succeeded in identifying several important copper veins. The studies of this scientist brought to light the principal facts of the country's geology. Following this, Professor H. Buttgenbach also completed some important studies. The region in which the copper deposits are located consists of hilly terrain, essentially formed by sedimentary rocks such as shales, limestones and conglomerates.

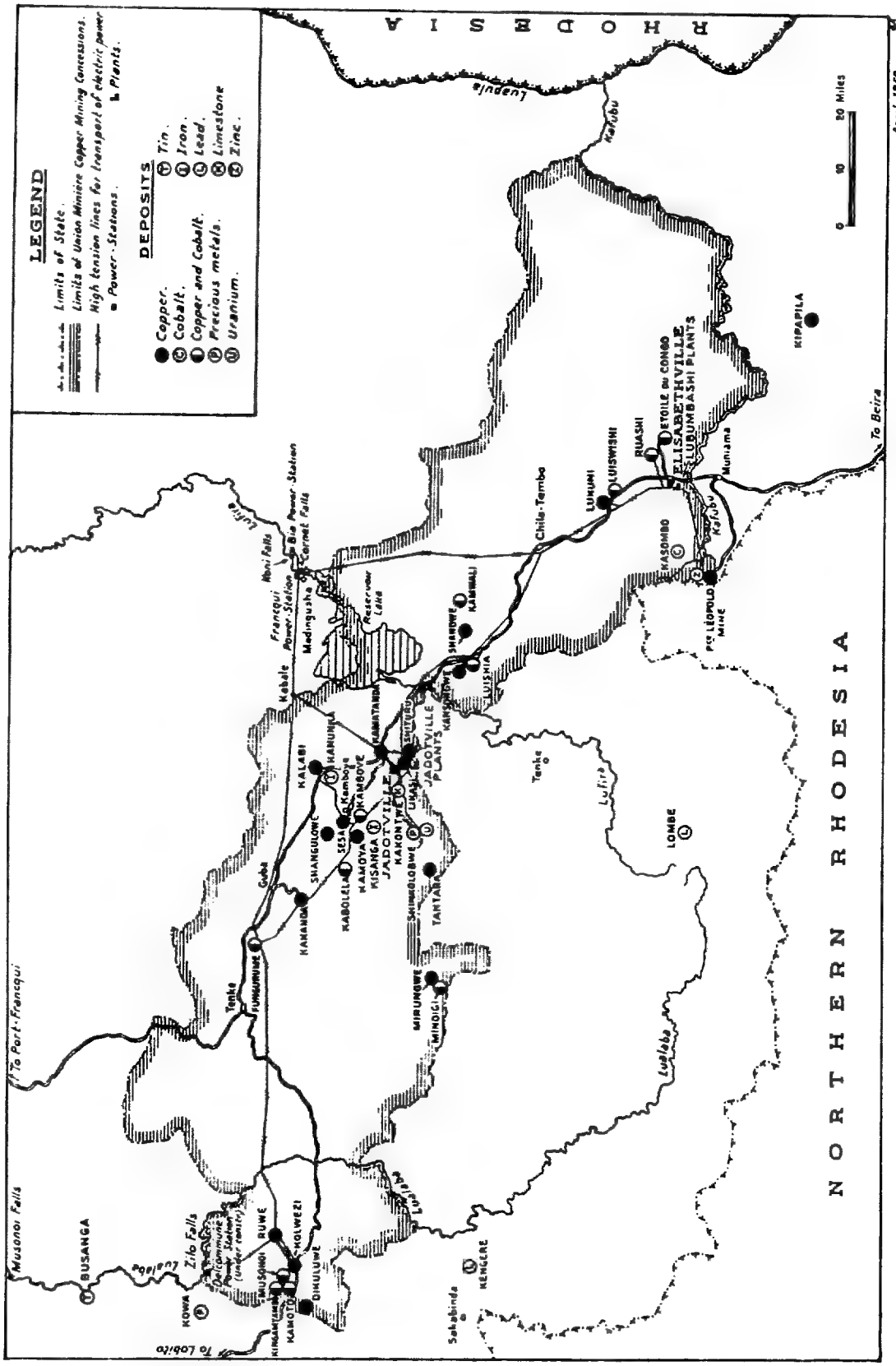
Just as in the Belgian Ardennes, the high chains of mountains originally produced by the folds of the earth have been reduced, by erosion, to peneplains. These different formations appear to have a general northwest. southeast direction, the regularity and parallel arrangment of their outcrops being interrupted by geological disturbances in the form of faults.

COPPER

The copper deposits currently being mined are located in these fault zones.

The ores are for the most part oxidized and appear as impregnations, concretions, and deposits in the sedimentary formations. The mineralization most commonly found are malachite (a green copper carbonate), chrysocolla (a blue copper

Jules Cornet, geologist and member of the Bia-Francqui expedition, established the basis of the Katanga geology and proved the richness of its natural resources.



silicate) and an oxide known as cuprite, as well as a number of other varieties.

Sulphide ores are found in depth in certain deposits in the zones unaltered by surface waters. The sulphide ores appear in the form of small veins and impregnations or spots. Chalcopyrite and bornite (combined copper and iron sulphides) together with Chalcocite (copper sulphide) are the most common varieties. In general, the mineralized zones differ in appearance from the surrounding formations from which they are separated by faults.

The search for orebodies is rendered more difficult by the scarcity of outcrops and the dense vegetation of the bush. The first veins were discovered in the course of rapid prospections, thanks to the existence of old native workings. Other deposits, discovered more recently, are buried under heavy overburdens and have to be explored by drilling. The total amount of drilling reached 49,000 feet in 1948.

COBALT

Some mines contain cobalt associated with copper. The recovery of this cobalt is carried out by means of special processes to be described later.

ZINC

The sulphides of the Prince Leopold Mine contain zinc sulphides intimately associated with copper ores. A differential flotation process permits their separation.

Part of the zinc sulphide concentrates are roasted so as to liberate their sulphur content and convert it into sulphuric acid, used for the chemical treatment of oxidized copper ores.

The remainder of the zinc concentrates, as well as the roasted concentrates, are exported almost exclusively to Belgium. In the not-too-distant future they will be treated at a plant being constructed by Metalkat at Kolwezi.

CADMIUM

The zinc concentrates mentioned above contain cadmium. A part of the cadmium is set free during the roasting process and a special plant produces a certain tonnage of metallic cadmium.

Cadmium is also recovered in the form of dust in the metallurgical plants.

TIN

Union Minière has a concession for the prospection of tin, located in the eastern part of the Lualaba district.

Up to 1946, mining operations were carried out on alluvial deposits formed by the disintegration of pegmatite and quartzite veins. At the Busanga mine, underground veins were worked by a series of galleries, and stopes.

These operations were gradually halted at the end of the war and at the present time the company no longer produces tin.

RADIUM

Uranium ore with a high radium content was discovered in the Katanga at Shinkolobwe.

The Katanga ores consist of pitchblende and its derivatives. A great number of varieties exist, recognizable by their green, yellow or orange color, such as chalcolite or torbernite (phosphouranate of copper), curite (uranate of lead), kasolite (silico-uranate of lead), schoepite (uranium oxide), etc. The radium content of these ores varies considerably but compared to similar ores previously prospected elsewhere, it is relatively high, thus permitting a substantial reduction in the sales price of radium.

A plant was built at Oolen, Belgium, by the Société Générale Métallurgique de Hoboken, for the treatment of Katanga uranium ores. The first grams of radium were produced in 1922 and since then, annual production has been regulated according to world demand.

Union Minière has placed important quantities of radium free at the disposal of the four Belgian universities, of hospitals and a number of other scientific institutions, in particular the Curie Institute, in order to assist them in their research work.

Capsules of this precious metal are also available to Congo hospitals.

PRECIOUS METALS

Precious metals, gold, silver, platinum, and palladium are found in some of the Union Minière deposits, either isolated as in the case of the Ruwe Mine or associated with copper.

The Ruwe gold mine, prospection of which started in 1907, also contains platinum and palladium.

The precious metals contained in the copper ores treated in the plants are recovered by a special process to be described later.

II. EVOLUTION OF METALLURGY

INITIAL DIFFICULTIES

The managers of the new company were faced with a complex problem. The proven orebodies were undoubtedly very rich but they were located in sparsely inhabited virgin territory, situated thousands of miles from the coast and hundreds of miles away from the nearest railroad.

These orebodies were in the form of oxides whereas most other known deposits in the world, up to that time, consisted of sulphide ores. The metallurgical treatment of these ores had therefore to be thoroughly studied and a suitable process evolved. In addition, the coke required for the metallurgical operations had, at first, to be imported from Europe. It subsequently became possible to have it supplied by the Wankie collieries in Southern Rhodesia. Competent white personnel had to be hired in Europe or in the United States, native workers had to be required from distant areas such as Lomami, Angola and Rhodesia.

DEVELOPMENT OF PRODUCTION

Union Minière began to benefit from its concessions even before the construction of the railroad which was to pass through the Katanga and link it with the South African rail network.

Considerable expense had to be incurred at the very start for the erection of the mining and metallurgical installations as well as for the construction of railroads, power lines, roads, houses, native camps, hospitals and schools.

The first metallurgical operations started in 1911 after completion of the railroad to the mines.

The first furnace to go into operation produced 998 tons of copper during that year. In 1912, production was 2,500 tons and in 1913, 7,500 tons.

Thus, by the time the first World War broke out in August 1914, Union Minière had hardly been active three years. From that time on, it was in a position to render large services to its allies. At that time, the copper resources of the British Empire were indeed very limited since the copper deposits of Rhodesia and Canada had not yet been brought into operation.

The plants were expanded and production increased from 10,000 tons in 1914 to 14,000 in 1915, 22,000 tons in 1916, and 27,000 tons in 1917, which was to be of great assistance to the British war effort.

In 1918, 1919 and 1920, production decreased to 20,000, 23,000 and 19,000 tons respectively, but in 1921, the postwar crisis having been weathered, 30,500 tons were produced and during the course of subsequent years, production increased regularly to 137,000 tons in 1929.

During the years 1931 and 1933, the copper industry was affected in a very special manner by the world depression. Following international agreements, production was brought back to levels more in accordance with demand but by 1934, business was improving and the previously accumulated stocks of copper having been absorbed, production was again raised. It reached 150,000 tons in 1937.

During the course of the war years 1939-1945, the company was able to bring much greater and

more extensive aid to the allied armies than it had in the first World War.

From 123,000 tons in 1939, its copper production was raised during the war to 166,000 tons per year, and beginning June 1940, this output was supplied to the British government.

The following figures show the production of copper during the course of the last ten years :

1940	149,000 tons
1941	162,000 tons
1942	166,000 tons
1943	157,000 tons
1944	165,000 tons
1945	160,000 tons
1946	144,000 tons
1947	151,000 tons
1948	155;500 tons
1949	141,000 tons

Union Minière's production of copper since its founding, and up to the end of 1949, amounted to 3,515,644 tons.

The above results place Union Minière among the largest producers of copper in the world.

At the request of the United States government, Union Minière also took the necessary steps during the war to greatly increase its production of cobalt, which attained two to three times the 1939 production. At present, production amounts to more than 4,000 tons per year.

The company has also developed to a maximum its production of cadmium, precious metals, zinc concentrates and uranium ores. Manganese ore produced by a subsidiary has also been exported in sizable quantity. All these metals and ores were furnished exclusively to the United States or to Great Britain during the war.

METALLURGICAL PROCESSES

The metallurgical processes have made great progress and improved enormously since the start of the company.

During the first fifteen years, only the oxide ores were treated but beginning in 1926, the Prince Leopold Mine entered the picture and since 1930, the Lubumbashi Smelter has been almost entirely supplied with the sulphide ores from this mine.

The company has built concentrators, in various locations, designed to enrich the poorer grade ores prior to their metallurgical treatment.

Finally, a large electrolytic plant, supplemented by a refinery and a reverberatory furnace installation, was constructed at Jadotville.

All these installations as well as their respective operations are described further on.

The following outlines provide a better resume of the operations than would a detailed description of the various processes covering treatment of the different types of ores from the moment of their extraction down to the finished products as exported, be they copper, cobalt, zinc, cadmium or precious metals.

III. UNION MINIÈRE MINES

The orebodies located in the Union Minière concession are divided into three principal groups: Southeastern, Central and Western.

THE SOUTHEASTERN MINES

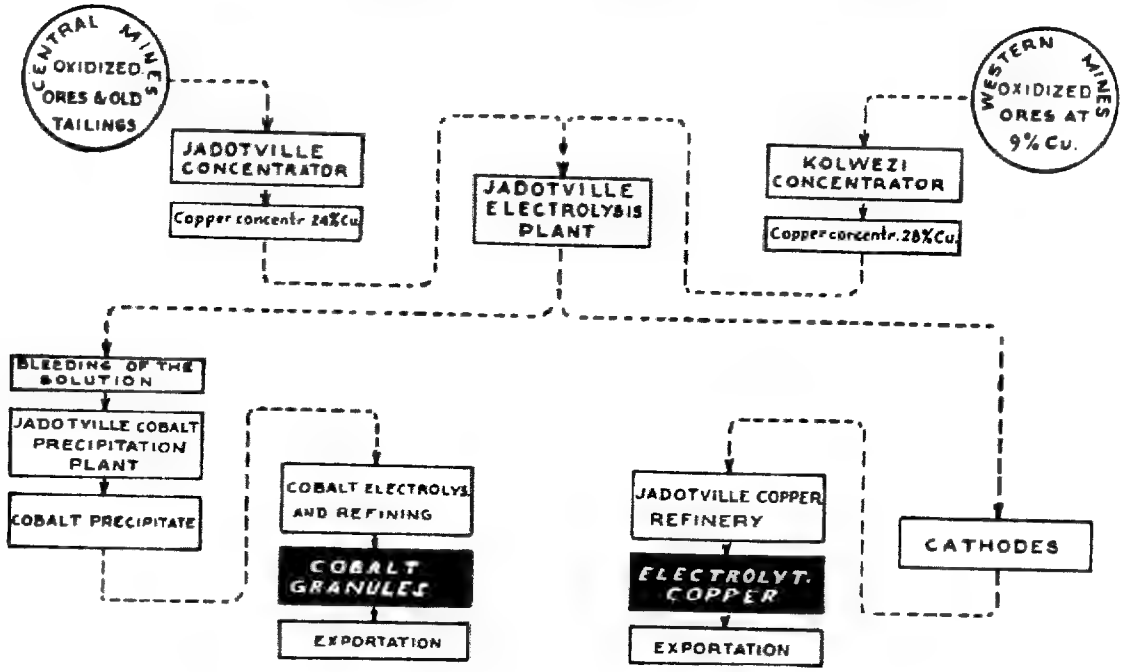
This group comprises the Kipushi, Lukuni, and Luiswhishi mines.

The Prince Leopold Mine at Kipushi

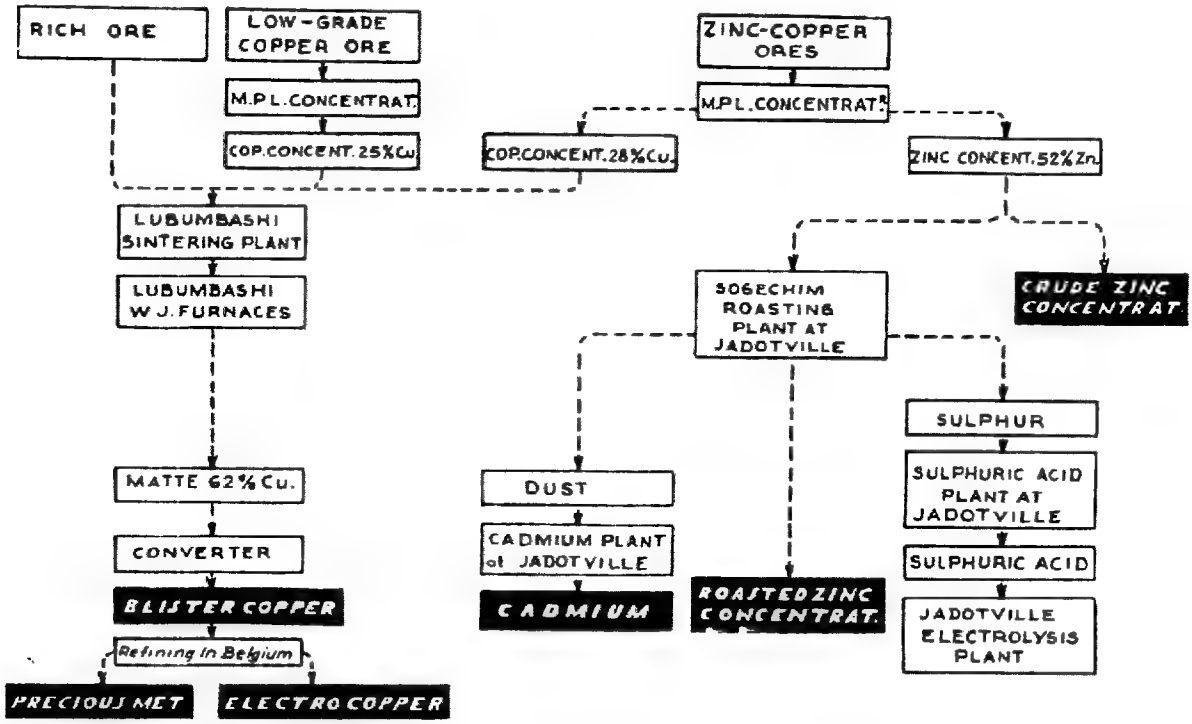
This mine was so named to commemorate the visit of the Crown Prince in 1925, and is situated at Kipushi, 19 miles from Elisabethville, on the Rhodesian border.

It has been in operation since 1926 and supplies the Lubumbashi smelter. The orebody consists of a highly mineralized vein of copper and zinc,

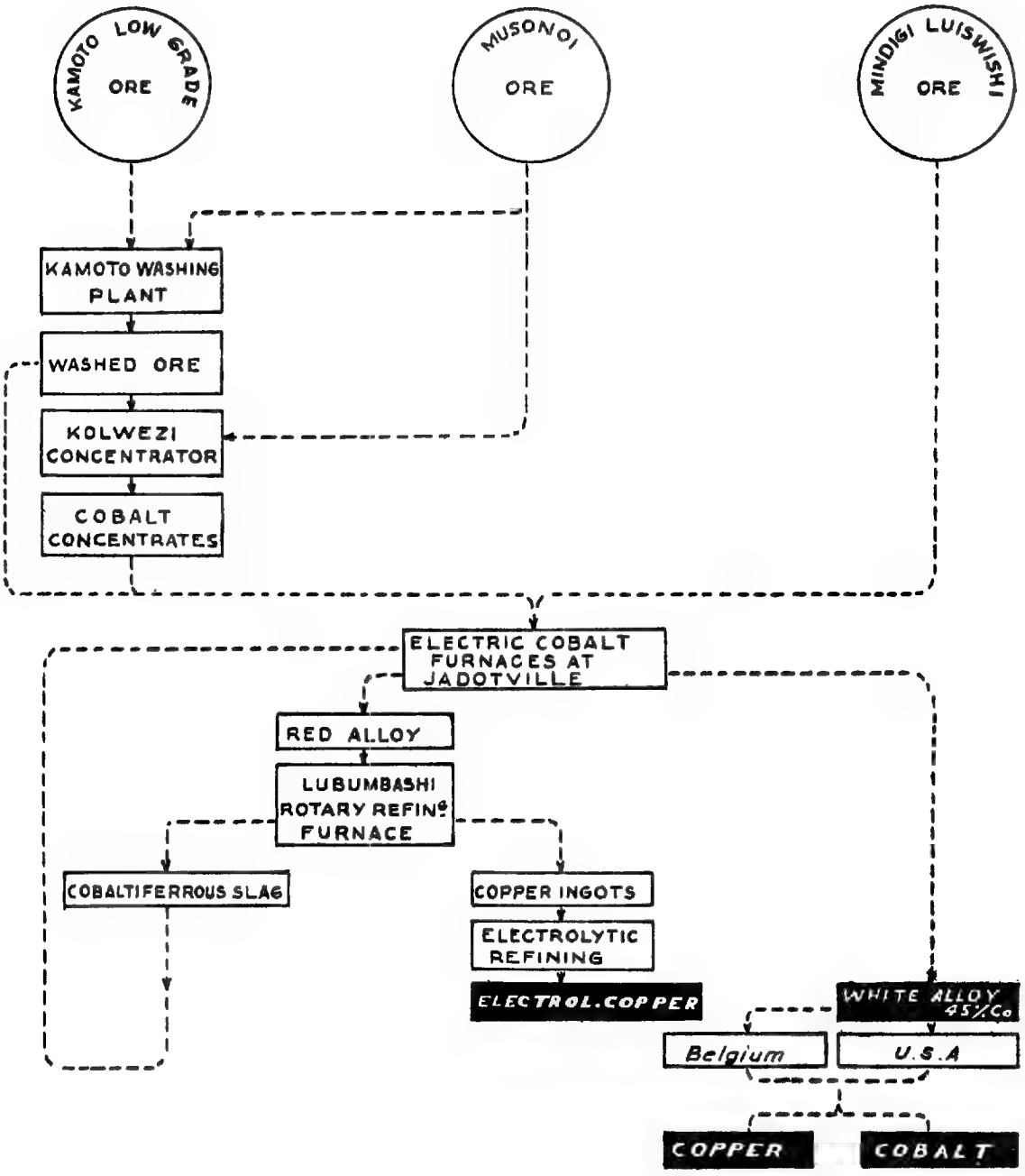
TREATMENT OF THE OXIDIZED COPPER ORES



TREATMENT OF THE SULPHIDE COPPER ORES OF PRINCE LEOPOLD MINE



TREATMENT OF THE COPPER COBALT ORES



65 to 200 feet wide, 1,300 to 2,000 feet long and with a 70° angle of decline. The ores also contain silver and cadmium.

The mineralization is oxidized at the surface but with depth, these oxidized ores are gradually replaced by sulphides.

The Kipushi orebody was discovered in 1899 by a prospector of the Tanganyika Concessions Ltd. but systematic prospecting was not begun until 1925 and mining proper began in 1926.

Work has been exclusively underground since 1930.

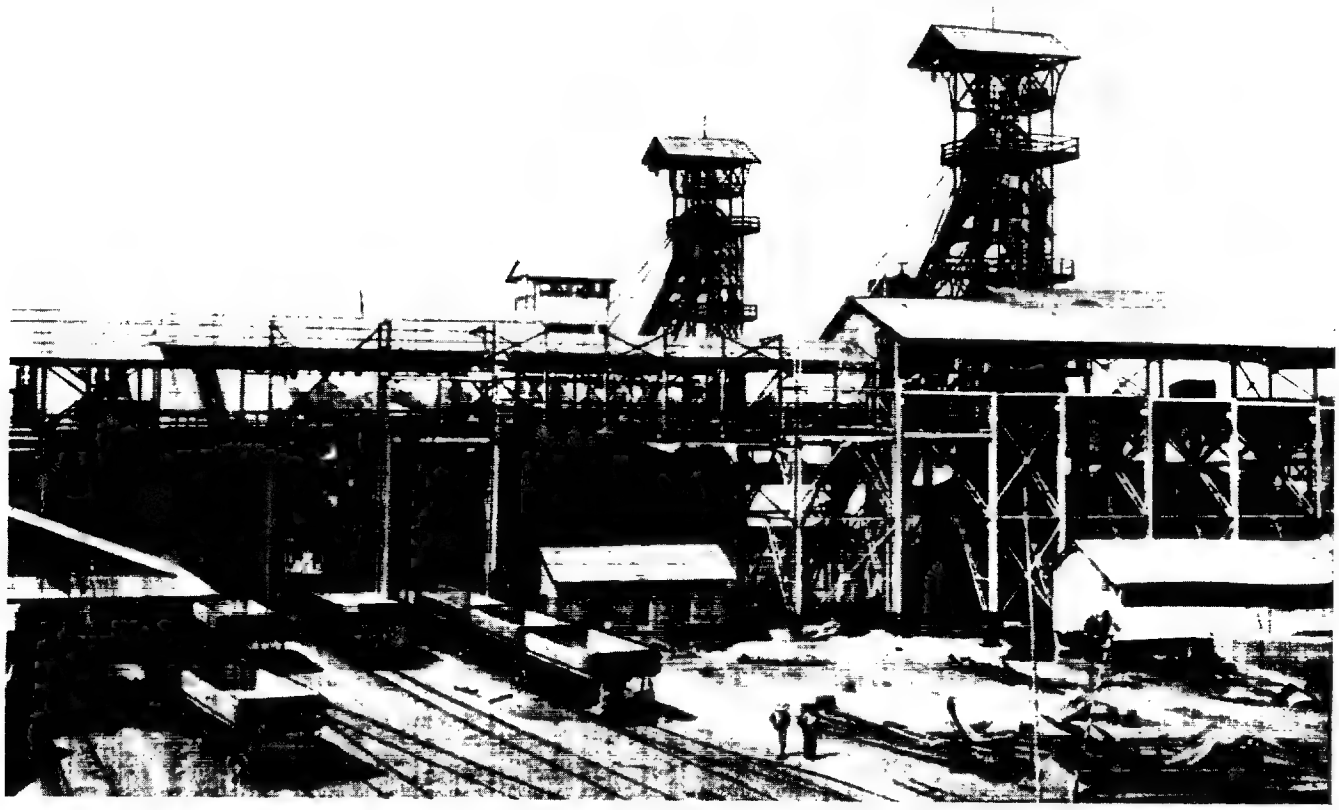
At the present time, the orebody is reached by three vertical shafts, 1,640 feet deep, situated in the dolomitic limestones of the footwall. One of these shafts is used for hoisting the ore, the second for lowering personnel and supplies, and the third contains pumping equipment and power lines.

The orebody is worked by horizontal top-slicing. The products are dropped down by gravity to the haulage levels whence they are conveyed to the hoisting shaft.

The distance between haulage levels was originally 115 feet, then 164 to 197 feet. The stopes are now between the 950 and 1,150-foot levels.

The 1,150 to 1,300 and 1,300 to 1,600-foot levels are now in the course of preparation.

The Prince Leopold Mine exploits an important mixed orebody which actually supplies all of the company's zinc and copper sulphide ores. Its annual production is about 300,000 tons of ore.



The ore is hoisted in 5-ton skips. A powerful pumping station consisting of five pumps, each with a capacity of 127,000 gallons an hour, is installed at the 1,640-foot level.

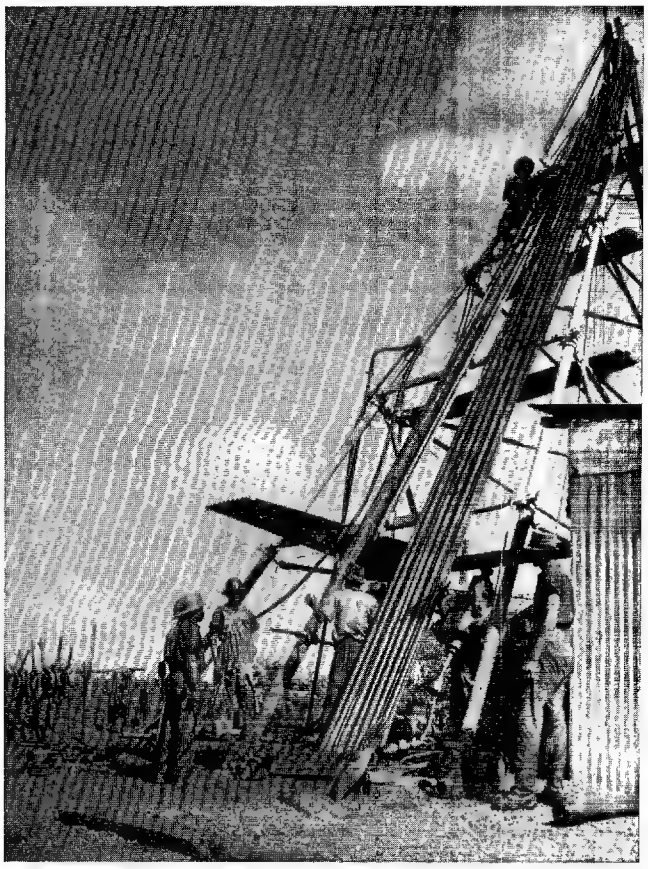
From 1925 to the end of 1949, this mine produced about 1,360,000 tons of copper.

The Lukuni and Luiswishi Mines

These mines, located some 12-1/2 miles northwest of Elisabethville, are less important. They are open-cut mines and produce oxidized copper ores (Lukuni) and mixed copper-cobalt ores (Luiswishi). The latter are sent for treatment to Jadotville, the former to either the Lubumbashi plant or the Panda concentrator, depending upon their assay.

The underground mining operations of the Prince Leopold Mine are currently being conducted at a depth of between 950 and 1,220 feet. The ore is broken up by explosives, the holes for the charges being drilled by pneumatic hammers.

The prospection in detail of future mining levels in the Prince Leopold Mine calls for a number of drill holes, either from the surface or from existing underground workings.



The ore is dropped through slopes at the bottom of which it is placed in cars which convey it to the shafts.

THE CENTRAL MINES

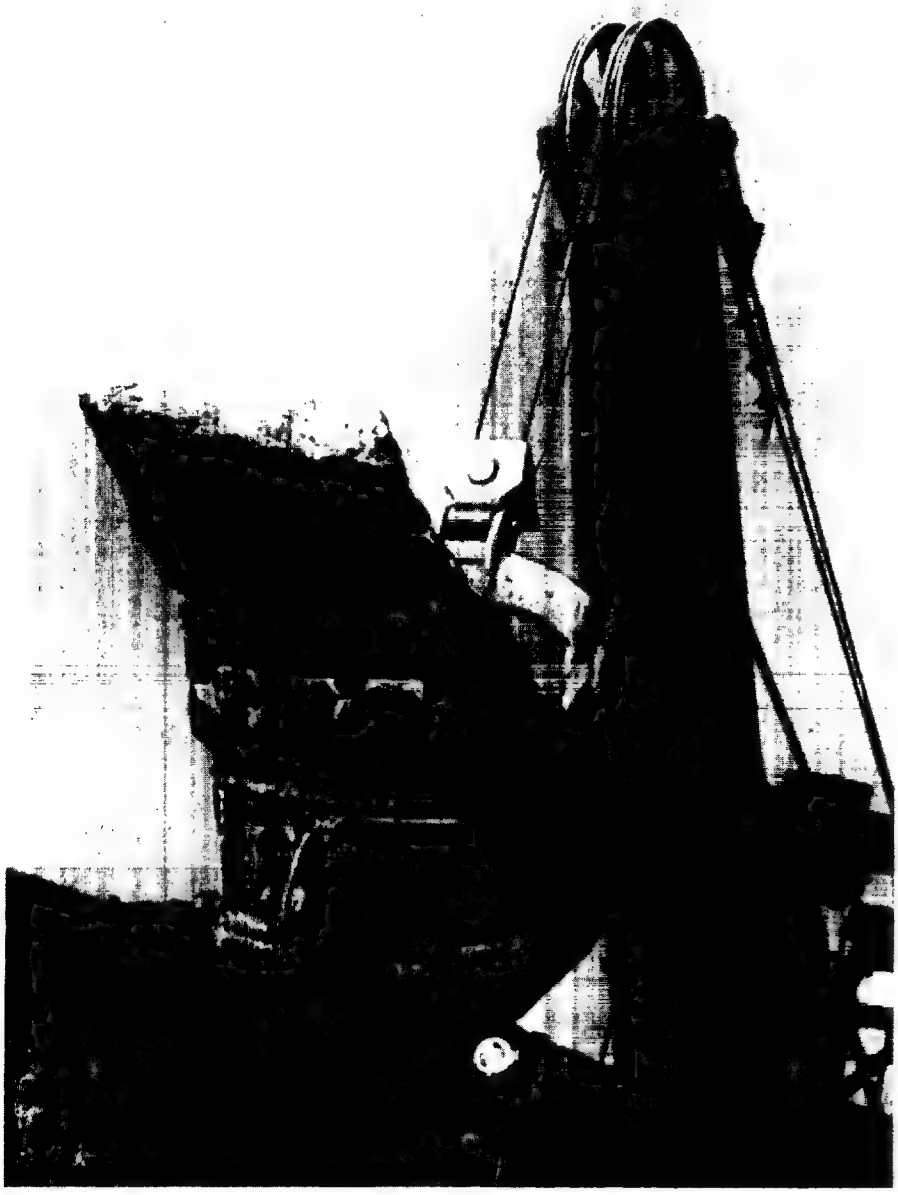
These copper mines, which for many years exclusively furnished the necessary supplies for the Jadotville plant, are now completely depleted of oxidized ores.

They formerly included the Kambove and Luishia group of mines, the Shituru, Mindigi and Kalabi mines. They now contribute to production to only a minor extent.

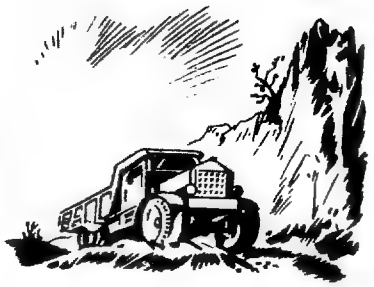
It is anticipated that the Kambove-West mine, where an interesting reserve of sulphide ore exists in depth, will again be placed into operation around 1953.

THE SHINKOLOBWE MINE

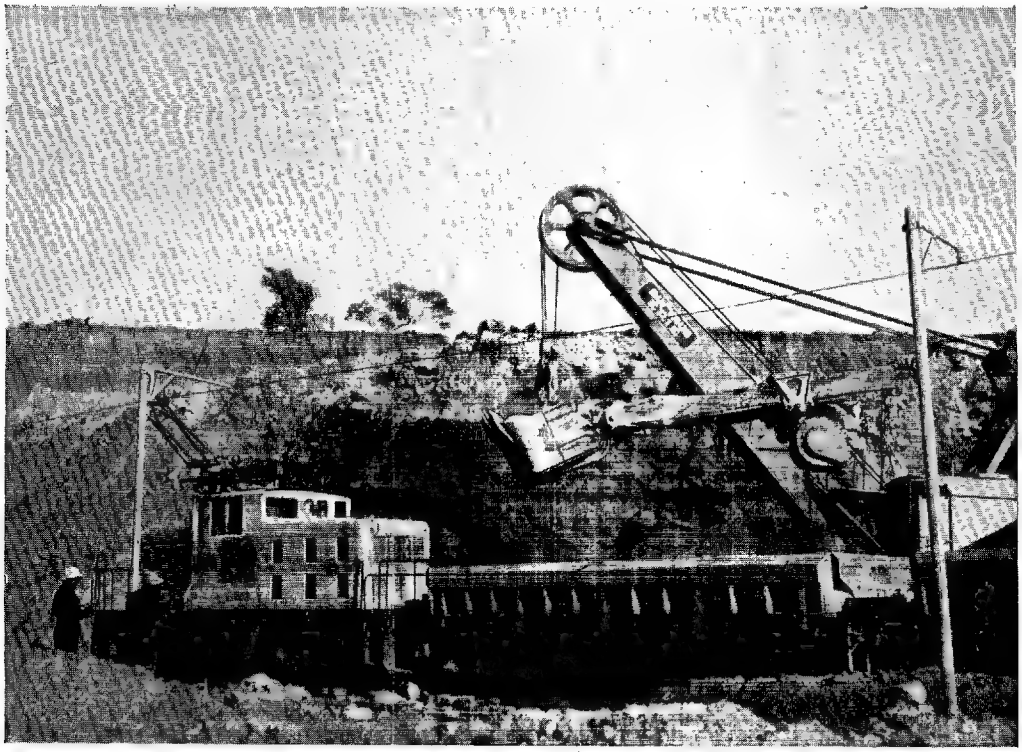
This orebody is located 15-1/2 miles south of Kambove. The existence of a copper mineraliz-



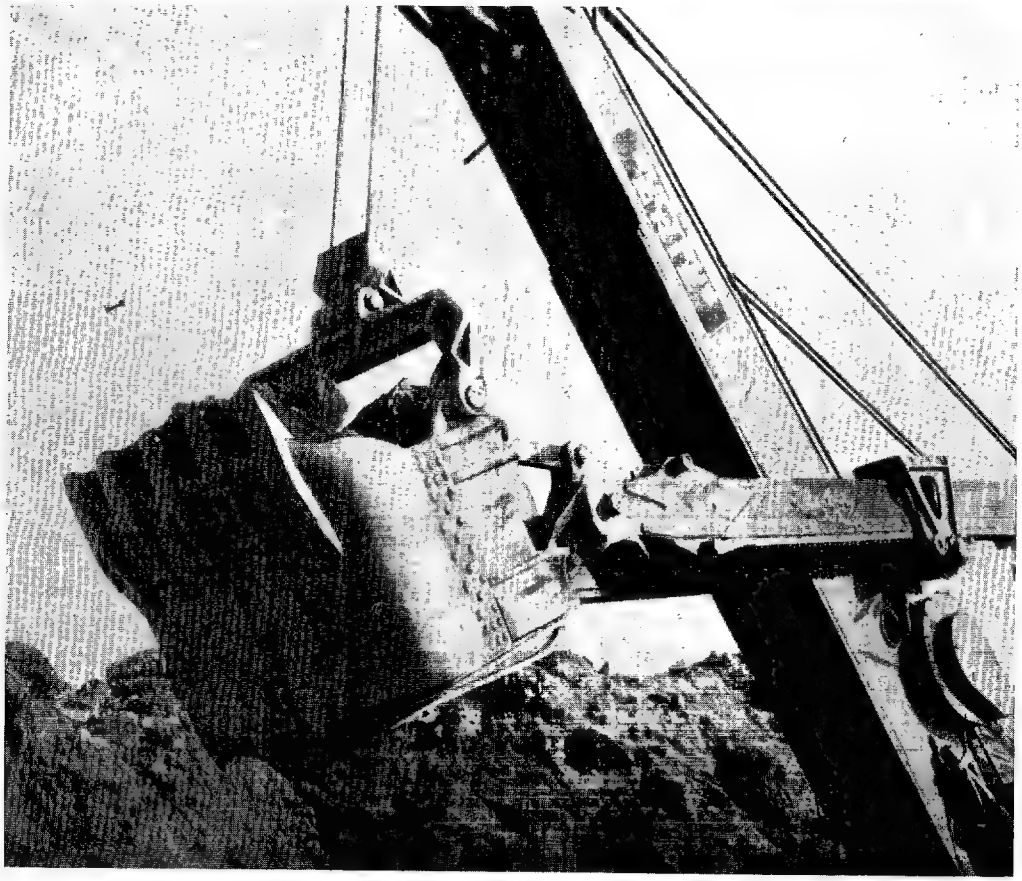
The Musonoi Mine produces a good part of the total extracted from the company's mines. As in the case of other company-owned open-pit mines, transportation of the products is assured by 20-ton capacity dump trucks.



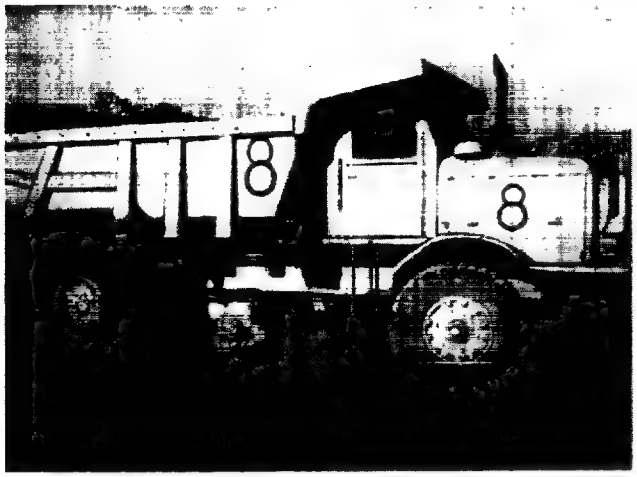
In its extensive surface mining operations, Union Minière uses a great many electric shovels, some of which can handle over 2,600 cubic yards per eight-hour shift.



The preparation of the Ruwe copper deposit located in the Western group of mines necessitated the removal of an overburden 130 to 165 feet thick. This operation took nine years to complete, during which time 12 million cubic yards of overburden were removed.



Removal of the ore in the open-cut mines is achieved by means of heavy electric shovels.



The variety of heavy equipment used in the surface mining operations is operated and maintained by native workers who have been specially trained in a company school.

ation in the neighborhood of Shinkolobwe had been noted as early as 1902 but the existence of radium and uranium was only discovered in 1915.

Subsequent prospecting resulted in the development of an exceptionally rich deposit of these two elements.

Operations were begun in 1921 after Société Générale Métallurgique de Hoboken had perfected a process for recovering the radium from these ores and a plant had been built at Oolen, Belgium, for the industrial application of this method.

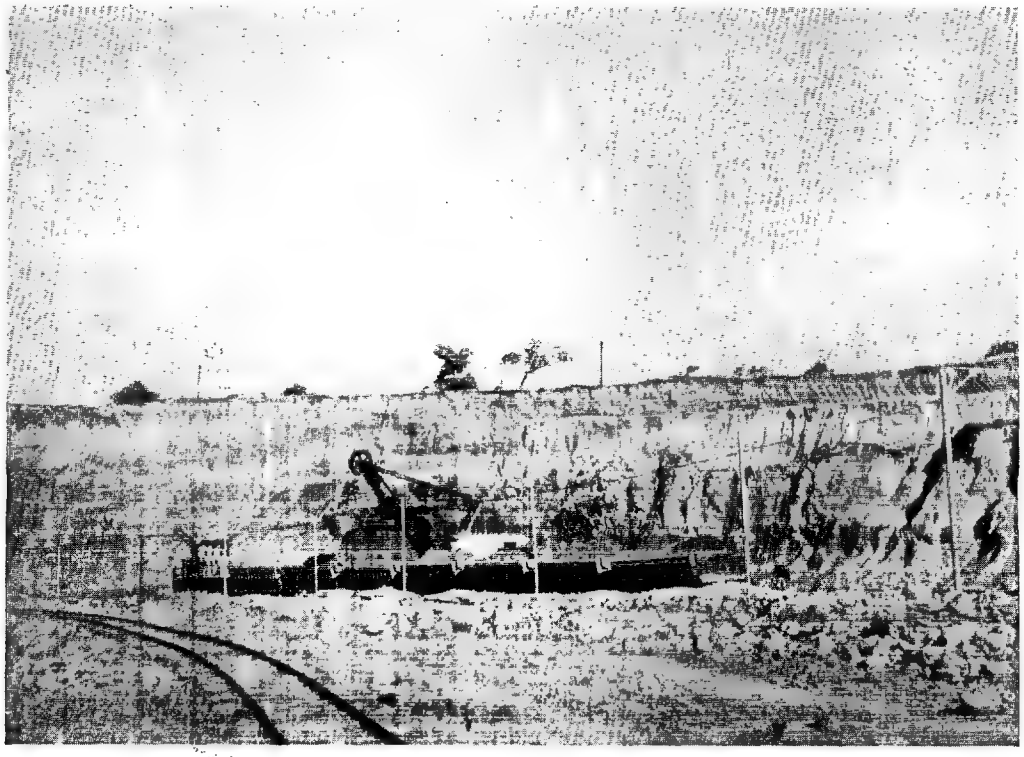
The orebody was first worked as an open-cut. At present work is underground.

The uranium contained in the ore at present constitutes the principal product of Shinkolobwe in view of its use in atomic energy operations. On the other hand, radium continues to find important uses in medical and industrial fields.

THE WESTERN MINES

These mines have been contributing regularly since 1941 to Union Minière's production. Thanks to their large reserves and to the depletion of the

The vast Musonoi copper-cobalt deposit contains large veins, especially rich in cobalt, which must be worked separately. In spite of this mixture of ores, their selective mining is successfully achieved, thanks to the combined use of electric shovels and motor dump trucks.



The Ruwe Mine exploits a copper deposit which will be called upon in the years ahead to supply an important part of the copper going to the electrolytic plant.

older Kambove and Luishia groups, they have developed very rapidly.

The Kolwezi Mine

The Kolwezi orebody was discovered in 1901 simultaneously with that of nearby Musonoi. It was previously worked by natives.

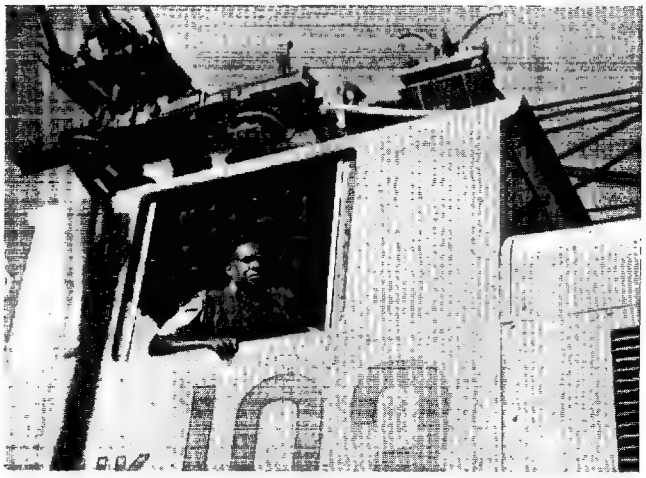
Prospecting began in 1904 and small-scale smelting tests were conducted from 1905 to 1908.

The mine, worked by the open-cut method, was opened in 1931 but remained in operation for a short time only, owing to the general curtailment in copper production.

Operations were resumed in 1937 and by 1941 it was regularly supplying the concentrator which had just been built.

Operations are carried out with large electric shovels and dump-cars of 20-ton capacity.

The lower part of the orebody will later be worked by underground methods.



The dump-cars are towed throughout the Ruwe Mine rail network by powerful electric locomotives operated by natives.

The Musonoi Mine

This orebody is located a little less than two miles west of Kolwezi. It was kept in reserve following the first systematic prospecting campaign undertaken in 1920. It was developed by drilling in 1939-1940.

Stripping operation by large electric shovels was begun in 1942. This mine has been feeding the Kolwezi concentrator since 1945.

The Musonoi ores are characterized by a high cobalt content. The cobalt which is concentrated simultaneously with the copper is recovered at the Shituru electrolytic plant.

The Kamoto Mine

Cobalt occurs at various locations in the Kolwezi region, particularly at Kamoto, 4-1/2 miles west of Kolwezi. The disintegration of the cobalt formations at this location has resulted in the formation of alluvial deposits, the working of which has made it possible to supply the electric furnaces at Jadotville with a substantial tonnage of high-content cobalt products.

The Kamoto orebody has been systematically prospected since 1939, proving the existence of low-grade ores whose content could be raised simply by washing.

A washing plant was built in 1942 and the products are sent either directly to the electric furnaces at Jadotville or to the concentrator at Kolwezi, depending upon their content.

The Ruwe Mine

The Ruwe orebody is located about 8 miles northeast of Kolwezi. The Tanganyika Concessions Ltd. prospectors discovered the existence of gold there in 1903. This mine was worked from 1907 to 1937, the gold being recovered either by surface washing or by cyanidation.

The presence of copper was noted at Ruwe on several occasions. Yet it was only in 1937, as a result of a search for precious metals, that the existence of a large deposit of oxidized copper, completely unsuspected up to that time, came to light.

The mining of this orebody necessitated a vast stripping operation requiring powerful equipment, large electric shovels, 30-ton capacity dump-cars, and electric locomotives.

The ore which appears in the form of soft fragments is easily concentrated by washing. A washing plant capable of treating 100,000 tons of ore per month was built for this purpose.

IV. UNION MINIÈRE PLANTS

CONCENTRATION OF ORES

Prior to treatment for the recovery of their metal content, most of the ores must be concentrated in specially designed plants.

The Jadotville-Panda Concentrator

This plant has a treating capacity of 100,000 tons of ore per month. It was built in 1921 with a view to enriching the oxidized ores of the Central Mines.

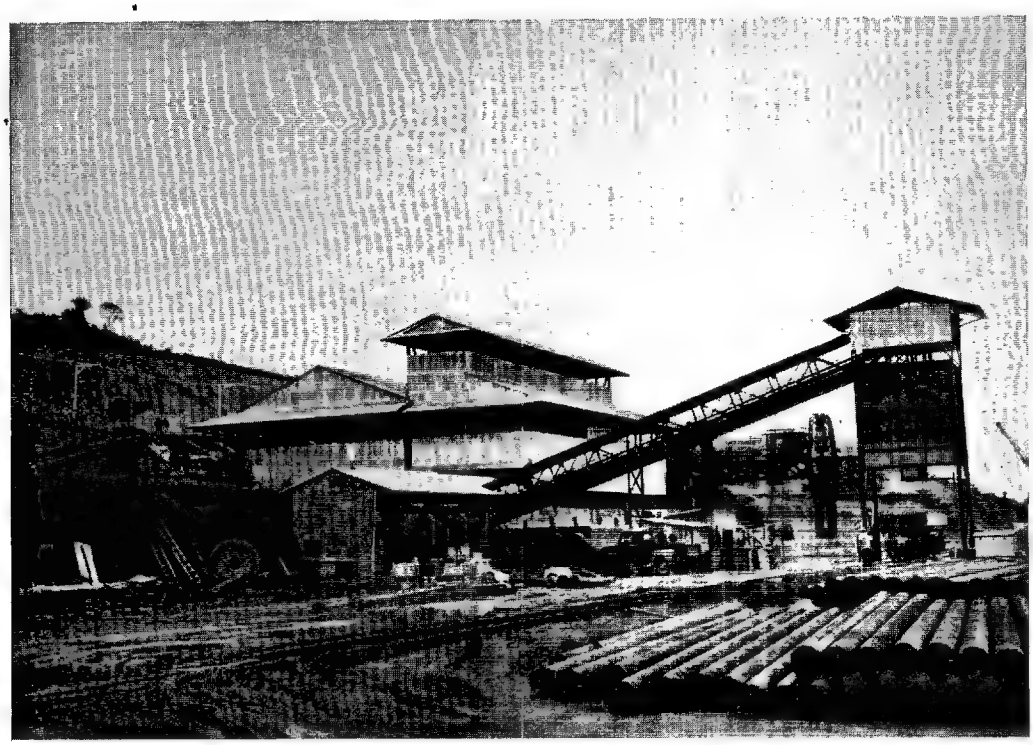
The concentrator comprises three sections:
Grinding,
Gravity concentration,
Flotation concentration.

The progressive depletion of the Central orebodies has considerably reduced supplies feeding this concentrator. At the present time, there are being treated in the flotation section, the rejects from the gravity concentrator to which have been added a small quantity of the ores still being produced by some of the mines in the Central group.

The ore, ground down to the required fineness, first passes through a series of machines in the gravity concentration section for classification according to size (screens, jigs and shaking tables), grinding (rod and ball mills) and classification by gravity (Hancock jigs, Wilfley tables). The copper remaining in the rejects of mechanical concentration is recovered by the flotation process.

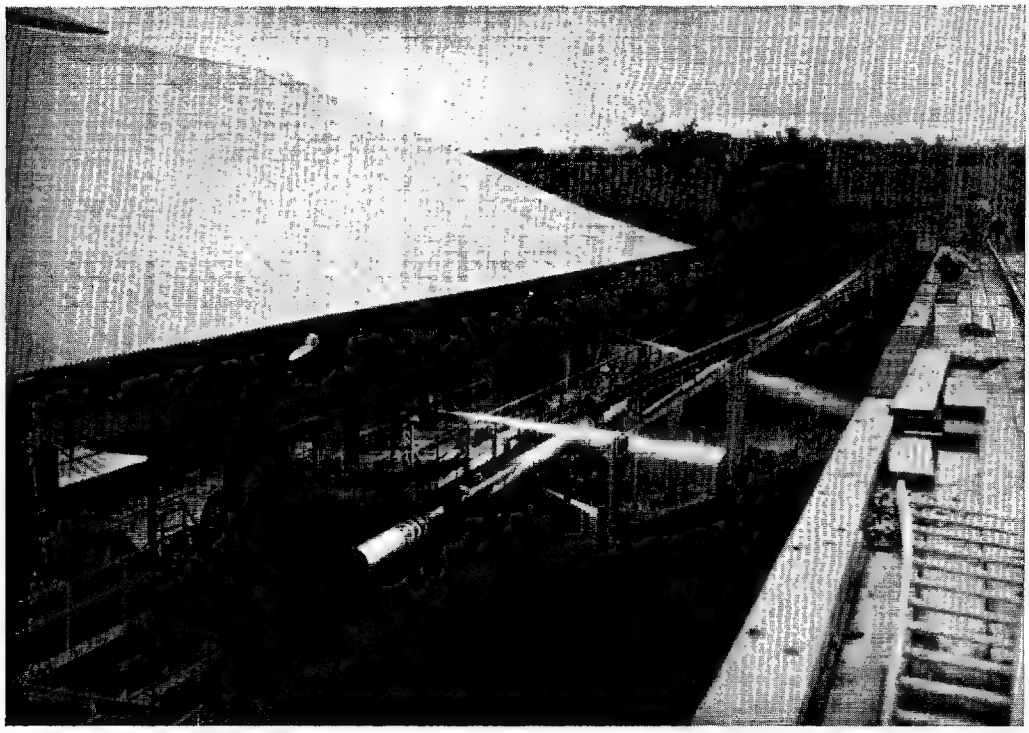
This process consists of agitating the finely-ground ore in an appropriate mixture of water and certain reagents. The latter enable the foam which is formed to collect the tiny particles of metal, and thus it is possible to collect the concentrates and the sterile rejects separately.

The plant thus produces gravity concentrates ranging from 25 to 30 per cent copper and flotation concentrates containing 23 to 25 per cent copper.

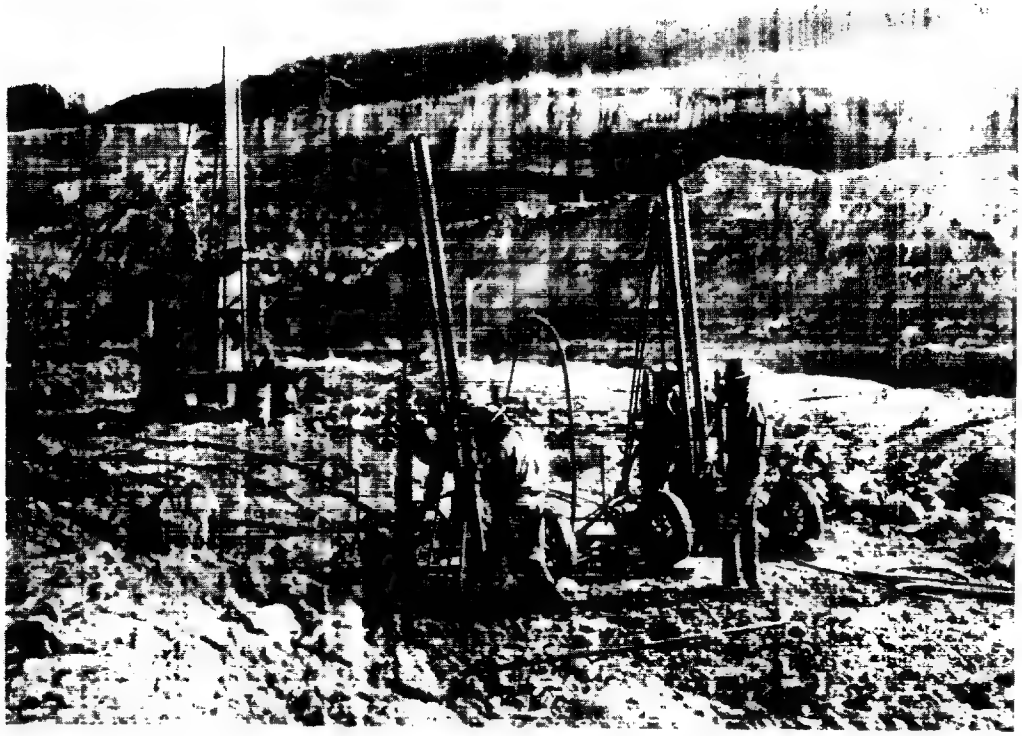


The Ruwe ores are washed in a plant built near the quarry. The final product is a concentrate containing about 34 per cent copper which is shipped to the Shituru electrolytic plant.

In the Ruwe washing plant, the ores are moved by water from the storage areas. The "Monitor", seen here, disintegrates the ore pile while adding the water which will serve for its washing. The washing plant has a capacity of 100,000 tons of ore per month.



The removal of overburden from the Ruwe Mine is taken care of by dump-cars of 30-ton capacity.



To speed up the work of the shovels, the rock in broken up beforehand by explosives. The drilling of the holes for the charges is performed with various types of drills.

The Kipushi concentrator treats most of the ores from the Prince Leopold Mine. It produces the copper concentrates destined for the Lubumbashi plant and the zinc concentrates which are exported, as it is or after roasting, to the Belgian smelters.

The concentrator was built on the side of a hill and the flow of material is therefore by gravity.

The Panda River, which flows nearby, furnishes a large volume of water throughout the year.

As soon as the backlog of gravity rejects has been depleted, the Kambove-West sulphide ores will be treated at the concentrator.

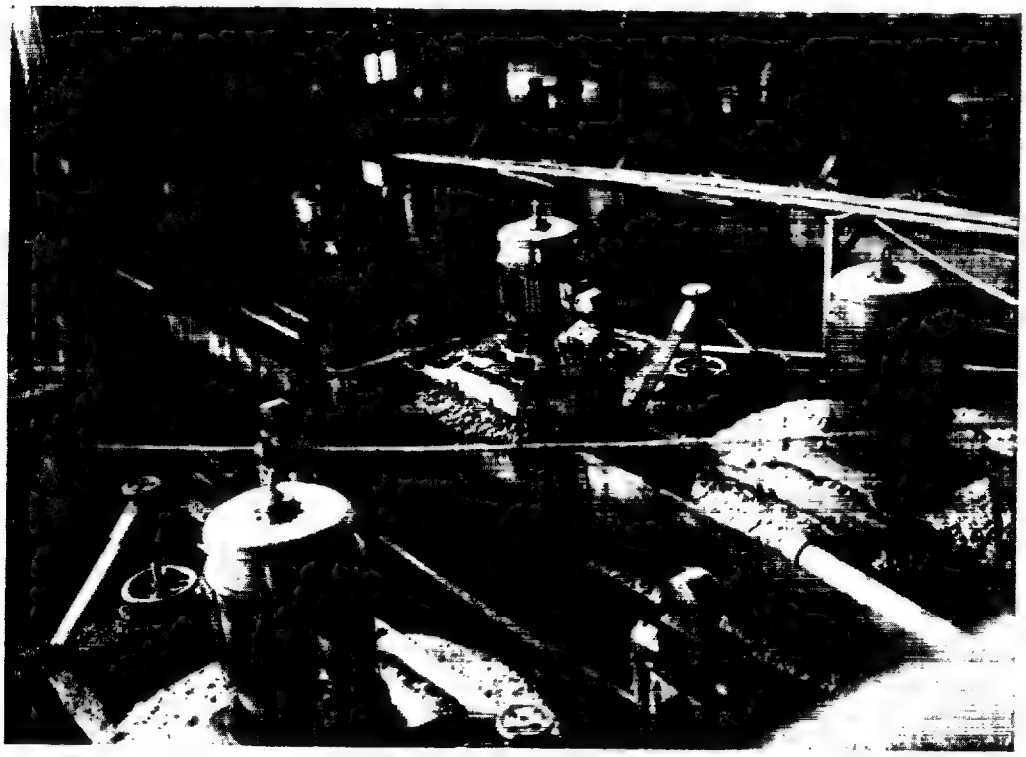
The Kipushi Concentrator

This concentrator, installed at the shaft heads of the Prince Leopold Mine, treats the ores deriving therefrom with the exception of those which can be treated directly in the Lubumbashi water-jacket furnaces.

Concentration is by the flotation process. Copper and zinc concentrates are produced by differential concentration of copper-zinc ore mixtures which constitute a good part of the mine reserves.

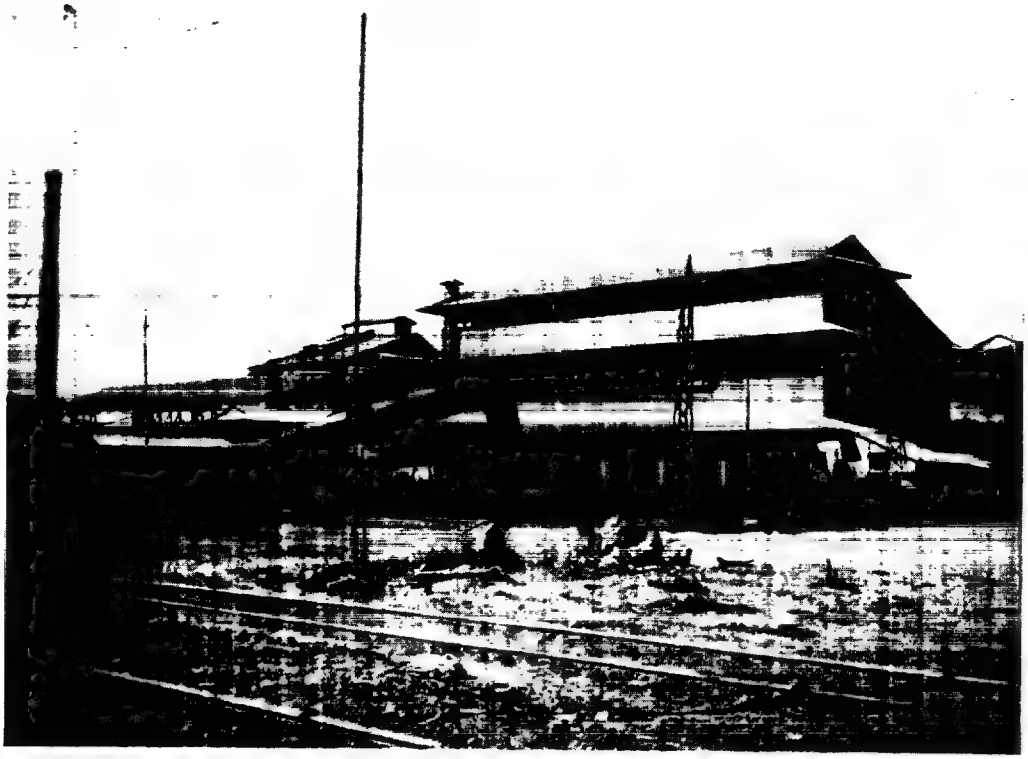
Straight concentration, giving copper concentrates, is also applied.

The monthly capacity of the concentrator is about 60,000 tons. This corresponds to the output rate at the mine.



The flotation process is used at the Kipushi concentrator. The capacity of the concentrator is of the order of 60,000 tons of ore per month.

The Kolwezi concentrator is supplied exclusively with the copper-cobalt ores of the Western deposits - Musonoi, Kolwezi, Kamoto... The copper and cobalt concentrates which it produces are respectively treated at the Shituru electrolytic plant and Panda electric cobalt furnaces. This concentrator can treat 100,000 tons of ore per month. Right, is an outside view of the crushing and granulating building.



The copper concentrates thus obtained have an approximate content of from 26 to 28 per cent copper. As for the zinc concentrates, those normally containing over 50 per cent zinc constitute the essential raw material used for the production of sulphuric acid at Sogechim.

The Kolwezi Concentrator

The Kolwezi concentrator went into operation in 1941.

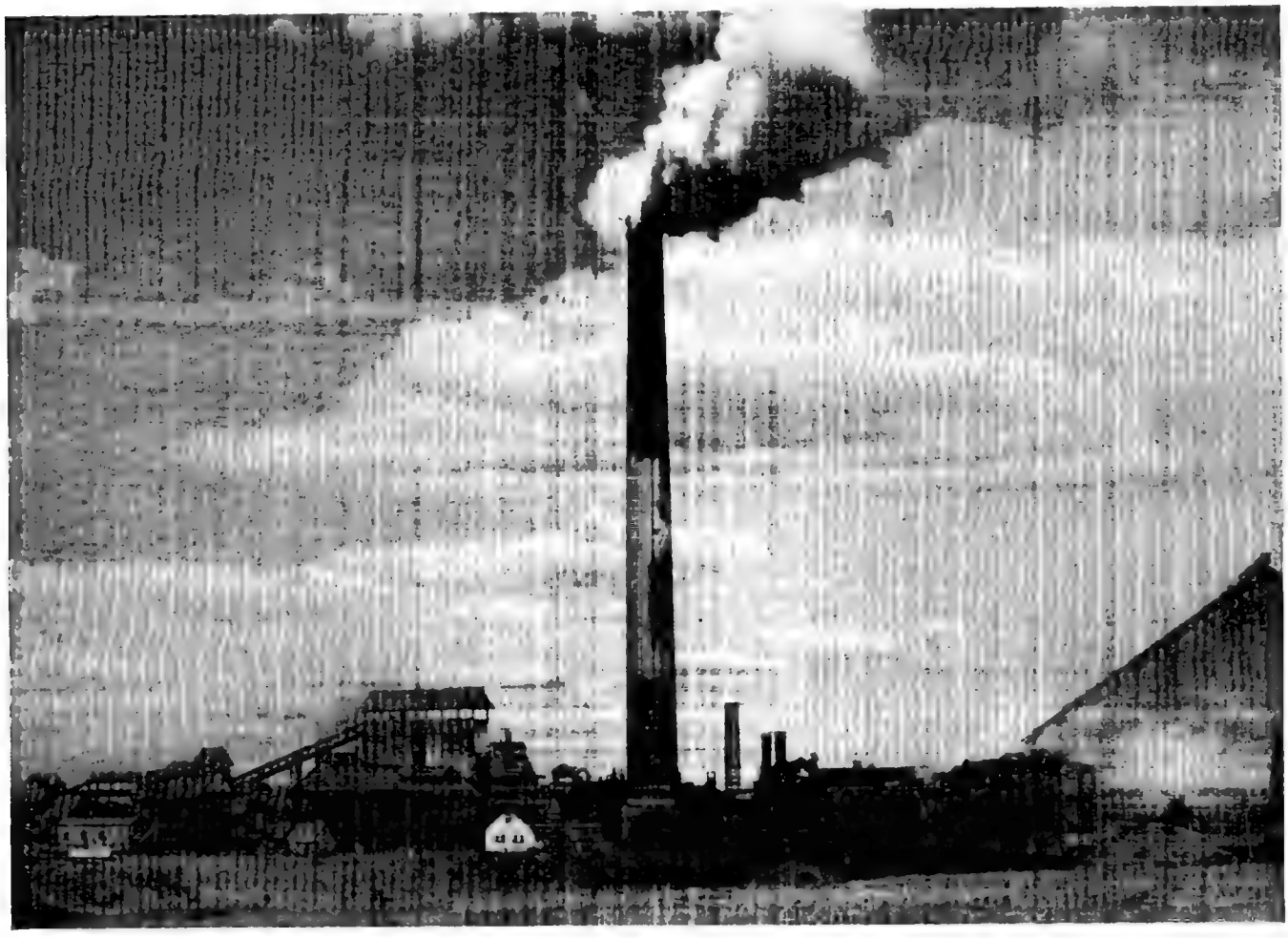
The capacity of this plant, which was originally designed to produce 50,000 tons of concentrates annually, was subsequently doubled in order to compensate for the reduced production of oxidized concentrates in the Jadotville group.

The crushing and grinding section makes possible the treatment of the various ores with equipment best suited to each type. Following a common crushing in jaw-crushers, the hard ores are ground in Symons grinders and the soft material in hammer mills.

The ores are brought down to the required degree of fineness in a grinding installation consisting of ball mills and Dorr classifiers. They are then subjected to hydrolized palm-oil flotation from which there is obtained a copper concentrate containing a greater or lesser amount of cobalt, depending upon the nature of the ores treated.

These concentrates constitute the normal feed for the Shituru electrolytic plant.

The Lubumbashi plant treating the sulphide ores and concentrates of the Prince Leopold Mine, as well as smaller tonnages of oxidized ores, produces blister copper. The annual production of this plant is 75,000 to 80,000 tons of copper.



Cobalt ores are periodically concentrated at the Kolwezi concentrator in order to ensure supplies for the Panda electric furnaces.

METALLURGICAL PLANTS

The Lubumbashi Plant

Construction of the Lubumbashi plant at Elisabethville was started in 1910 simultaneously with the equipping of the nearby Star of the Congo mine. It derived its name from the Lubumbashi River near which it was built in order to have available the constant supply of water needed the year round.

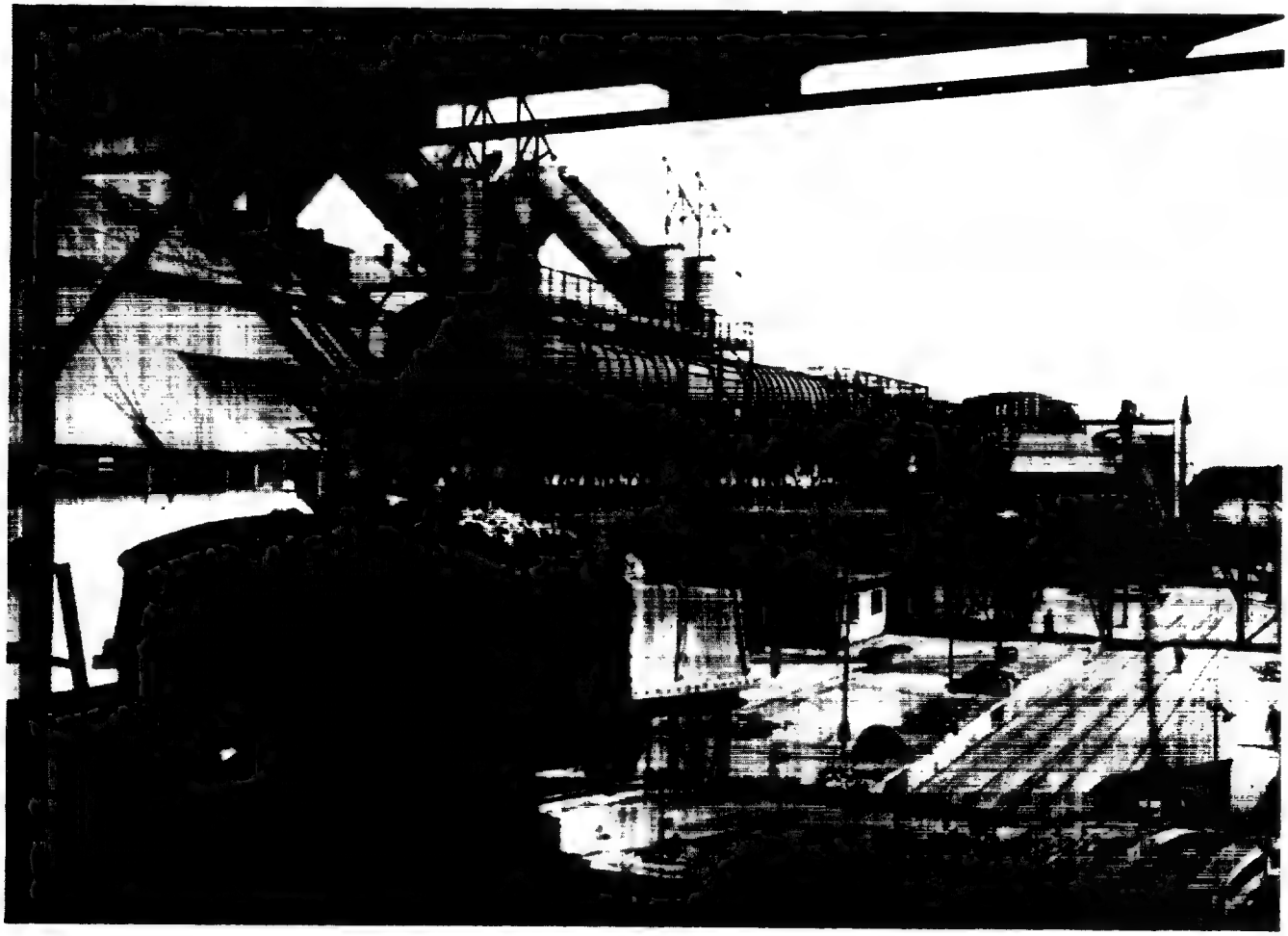
The first furnace was fired in 1911. The plant at present consists of four blast furnaces of the "water-jacket" type, so named because their walls consist of metallic water-cooled jackets.

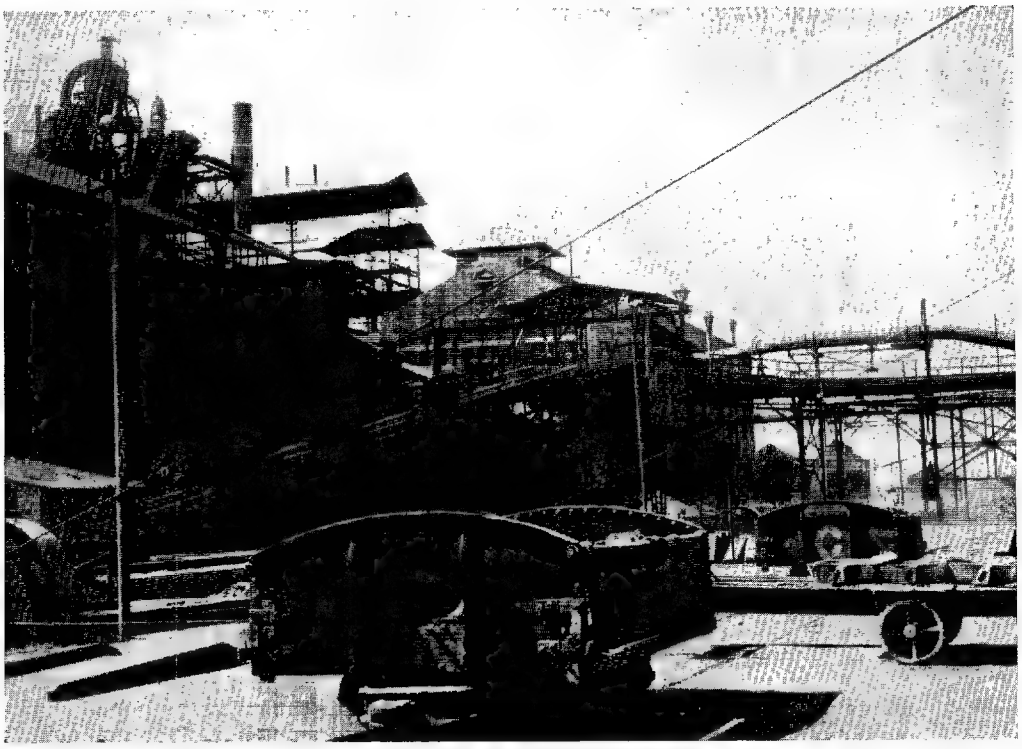
The plant at present almost exclusively treats the ores from the Prince Leopold Mine.

These are first sintered and roasted and then put through the water-jacket furnaces. The copper matte thus produced is then converted into blister copper which is in turn cast into ingots for refining at the Oolen plant of the Société Générale Métallurgique de Hoboken in Belgium.

Roasting and Sintering Equipment. — The sulphide ores and concentrates of the Prince Leopold Mine contain too much sulphur to be smelted

After agglomeration, the copper concentrates are melted in water-jacket furnaces which produce a matte containing about 65 per cent copper.

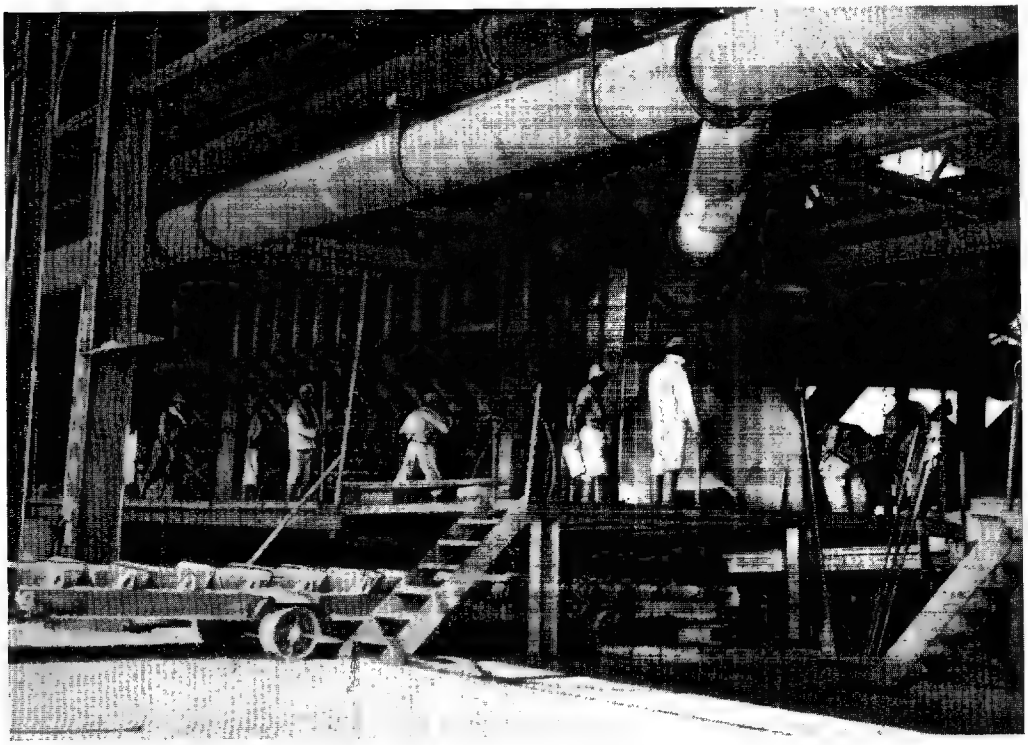




The loading-cars containing the melting charge and coke are sent up an incline to the furnace loading-platform.

directly in the water-jacket furnaces and to give a satisfactory copper content in the matte. The concentrates are too fine to be treated in the furnace in their original form and must therefore be subjected to a sintering process.

Such is the double function (sulphur removal



The liquid matte and slags produced in the water-jacket furnaces accumulate at the bottom of the furnaces, whence they are run out separately.

The liquid matte is passed on to a waiting furnace, whence it is taken to the converter.

and agglomeration of the sintering installation which, in addition to equipment for crushing, blending and mixing the components of the charge, includes three sintering machines of the "Dwight and Lloyd" type in which a large part of the sulphur is removed by combustion.

The sulphur dioxyde gases are expelled through a stack, 492 feet high, one of the tallest in the world.

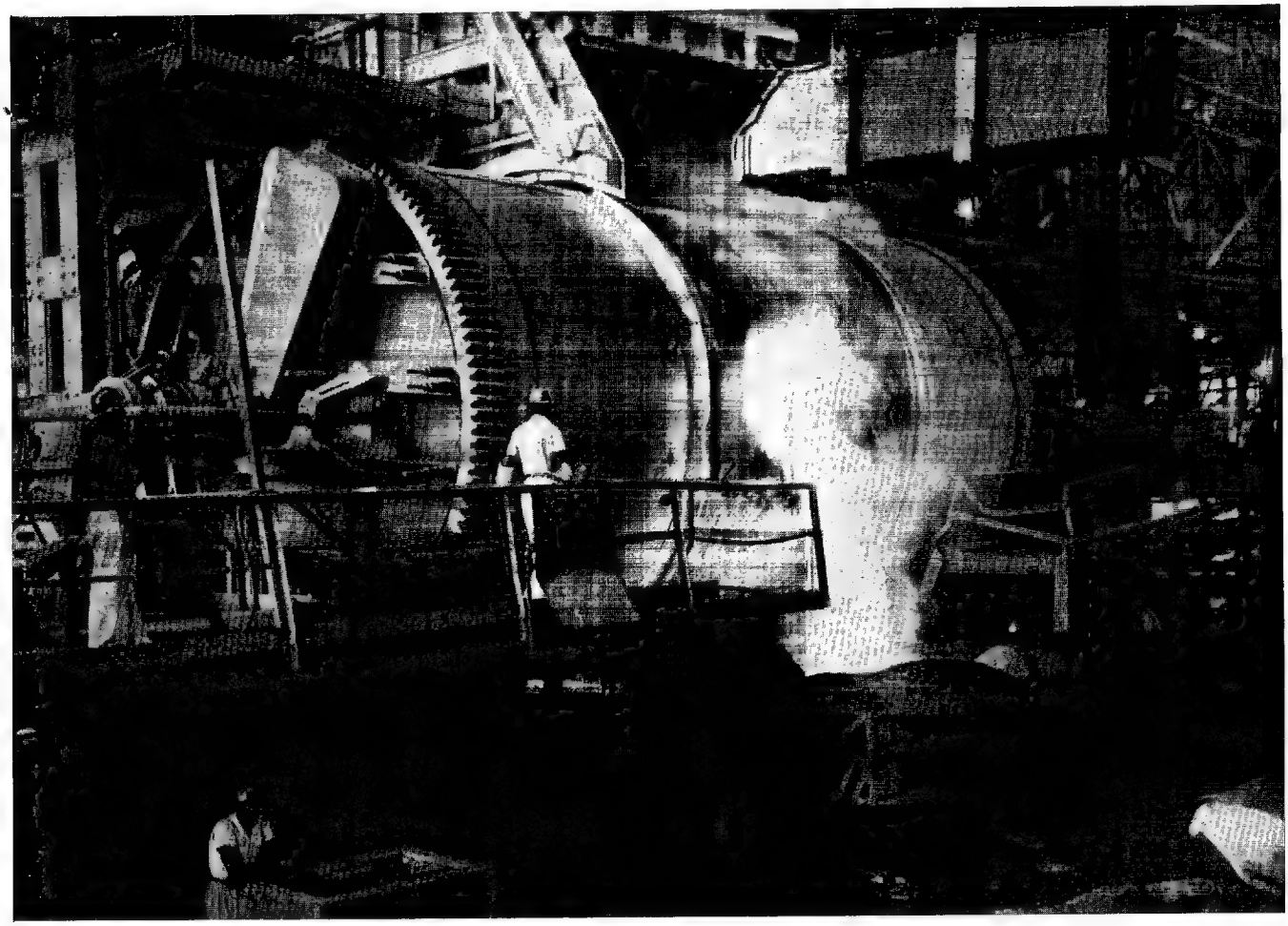
It should be noted that a small quantity of oxidized ore is added to the sulphide ores of the Prince Leopold Mine in order to obtain a suitable slag at the water-jacket furnaces.

Water-jackets furnaces. — The ores sintered in the above-described installation are charged into the water-jacket furnaces together with coke and fluxes in the form of limestone. The coke is brought from Wankie in Southern Rhodesia.

In the melting zone of the furnace where the temperature is 2,380° F, the silica and alumina in the ore combine with the lime and iron oxide of the charge to form a fluid slag which absorbs most of the zinc contained in a large part of the ores from the Prince Leopold Mine. This slag is run off through a tap-hole located in the upper part of the crucible. It is then granulated by a jet of cold water which carries it into the settling ponds whence it is removed by hoppers moving on monorails, and is lifted to a high dump by means of small automatic dump-cars travelling up an incline.

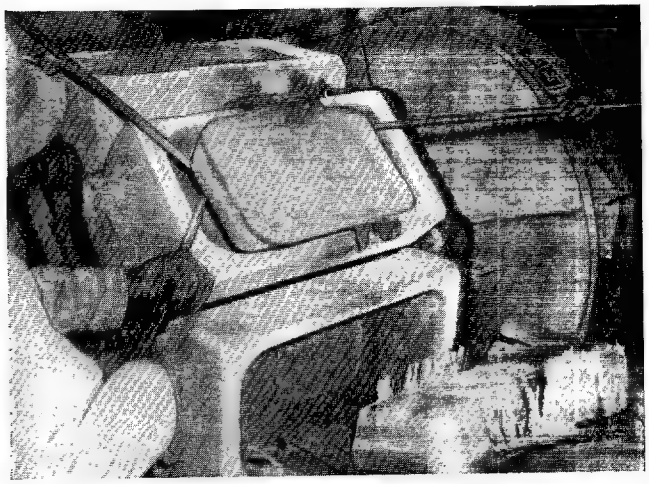
Because of its great affinity for sulphur, the

As it leaves the furnaces, the slag is granulated in water and conveyed in crane-operated ladles for loading into slag dump-cars.



In the converter, the matte is transformed into blister copper.

The blister copper is cast into ingots containing 98.5 per cent copper. These are shipped to Belgium for refining in the Société Générale Métallurgique de Hoboken plant.



copper combines with it to form a sulphide, which is the principal constituent of the matte. The gases are led through a cyclone dust collector and filter bags before joining other plant smokes in the large stack.

The matte, containing 63 to 64 per cent copper, is run through a channel to the waiting furnace.

The latter, heated by pulverized coal, maintains the matte in liquid form. It can hold about 120 tons.

The Converter. — The liquid matte is conveyed from the furnace into the converter by means of large steel ladles of 142 cubic feet capacity.

The converter is a cylinder about 30 feet long and 13 feet in diameter, made of thick steel plate lined with refractory brick. It has about 50 pipes through which air under pressure is applied to the liquid matte bath.

The oxygen in the air reacts with the liquid matte and gradually converts it to copper while the sulphur is freed in the form of sulphurous gases.

The air also reacts with the impurities in the matte to form a slag for the formation of which silica is added.

This slag is periodically removed by scouring the bath.

When the charge has been completely converted into copper, blowing is halted and the converter is tipped over to empty it of its contents, consisting of blister copper 98.5 to 99 per cent pure.

This product is emptied into ladles similar to those used for charging the converter and is then immediately poured therefrom into the rotary pouring furnace from which ingots, weighing from 310 to 400 pounds, are cast at a rate of 300 tons per day.

Auxiliary Installations. — Prior to the placing into operation of the Cornet Falls hydroelectric power plant, electric power was supplied by a steam plant which is still in existence and actually serves as a reserve. The latter will be covered later herein.

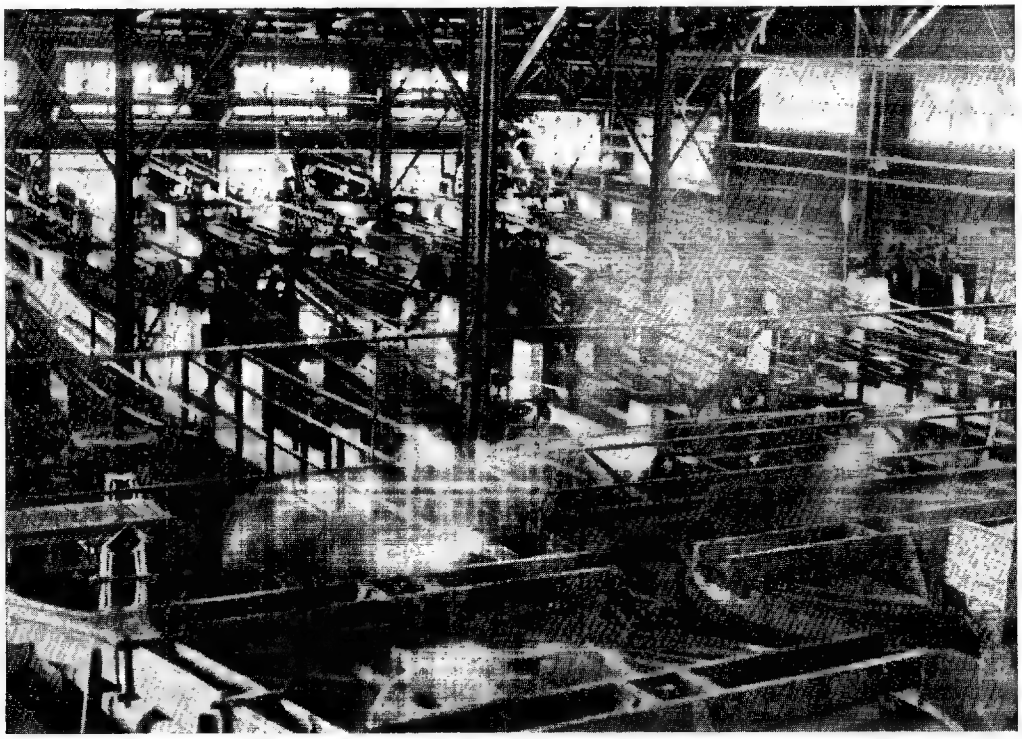
Maintenance workshops include a forge, machine shop, copper-smith's shop, molds and other metal frames, electrical repair shop and a carpenter's shop.

Also to be noted is an important sampling and analyzing laboratory.

There is also the transformer sub-station belonging to Sogelec, the coal pulverization plant with a capacity of 200 tons per day, and the slag heap installation.

The Shituru plant near Jadotville includes an electrolytic plant which treats most of the Kolwezi concentrates and those from Panda, a copper refinery and a cobalt refinery. Its annual capacity is 100,000 tons of "electro" copper and 2,000 tons of cobalt granules.

The copper-cobalt concentrates are leached with sulphuric acid in tanks, the upper portions of which appear in the foreground. Separation of the solids from the solution is achieved by means of classifiers and decanters.

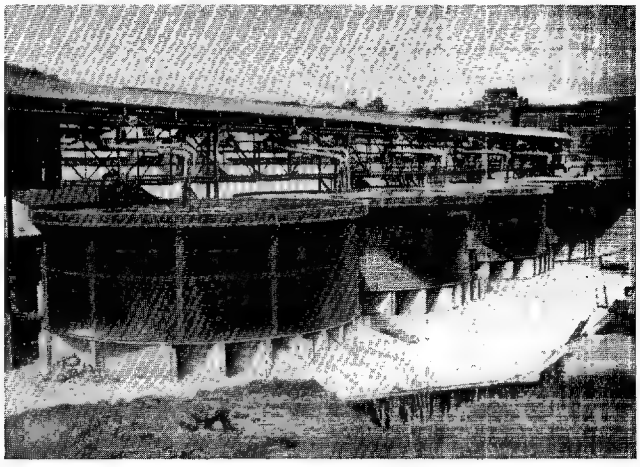


In addition to the three Dwight and Lloyd machines mentioned earlier, there are also two similar and smaller pieces of equipment which, in principle, are used only for certain accessory operations.

The Jadotville Plant

The Jadotville plant, which constitutes the most important industrial group of the Belgian Congo, consists of the following buildings :

The remaining solid particles contained in the solution are retained in gravel filters.



Ore concentration plant (described earlier),
Copper leaching and electrolysis plant,
Cobalt electrolysis plant,
Electric furnace cobalt plant,
Central workshop,
Power and related plants (see chapter on Electric Power),
Plant for the production of oxygen through liquefaction of air,
Electric workshop.

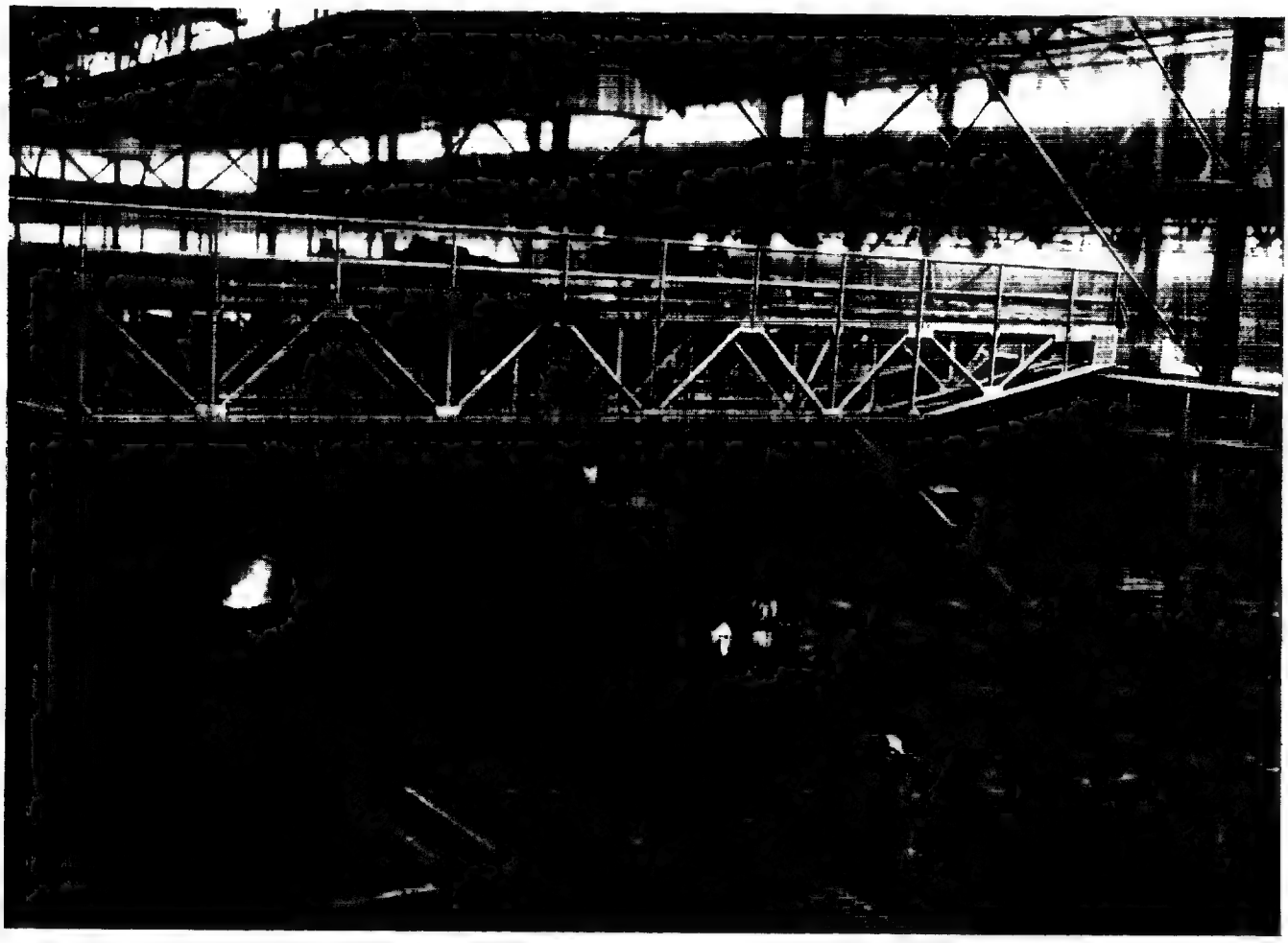
These plants are served by multiple auxiliary services.

The railroads within these plants are 25 miles long. They are electrified

Copper Leaching and Electrolysis. — Virtually all of the oxidized ores extracted from the mines are treated after concentration by leaching followed by electrolysis.

The process consists of dissolving the copper contained in the ore by means of dilute sulphuric acid (leaching) and recovering it from the copper sulphate thus obtained, by subjecting the latter to the action of an electric current (electrolysis).

This process had already been in use in certain plants in the United States and Chile prior to its application at Union Minière but it required very



Electrolysis of the solution is carried out in a series of 160 concrete tanks.

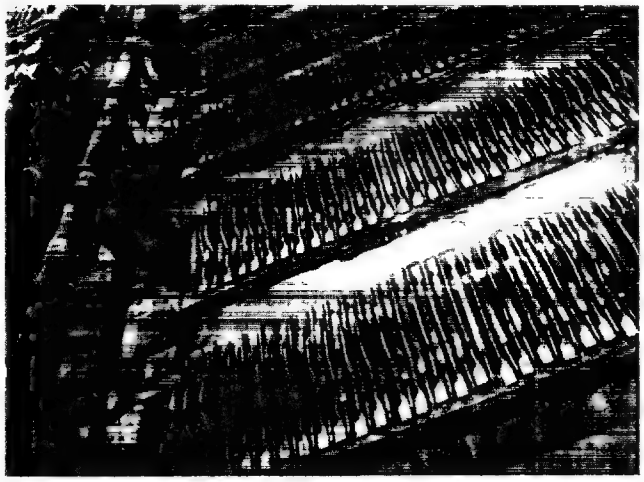
careful adjusting before it could be applied to the particular case of the Katanga ores. The concentrates presently being so treated are those produced at the Jadotville and Kolwezi concentrators.

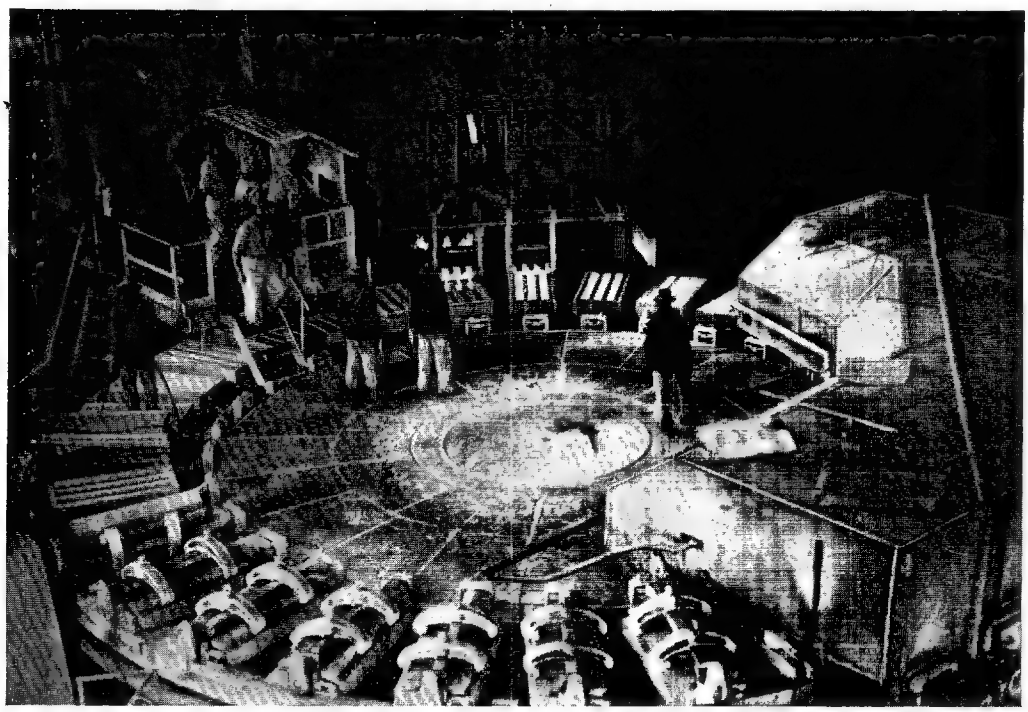
They are delivered in full carload lots to a storeroom having a capacity of 15,000 tons, where they are piled and then drawn upon by special equipment.

Conveyor belts take them to the leaching section.

The ore is mixed in an acid solution in pachuca tanks and the mixture is then decanted and washed in classifiers and a series of decanters, each measuring 69 feet in diameter. The solution is freed of its last solid particles by means of large gravel filters.

Each tank contains 191 anodes and 188 cathodes, alternately spaced at a distance of about 1.75 inches. At the start of the operation, the cathodes consist of thin copper sheets. Under the action of the electric current, the copper in the solution is deposited on these sheets which gradually become thicker.

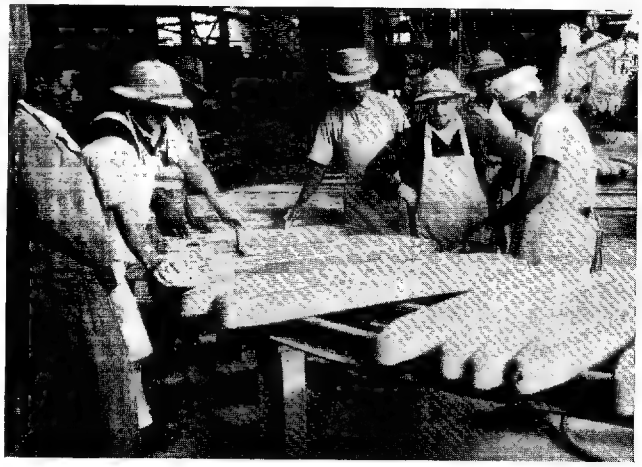




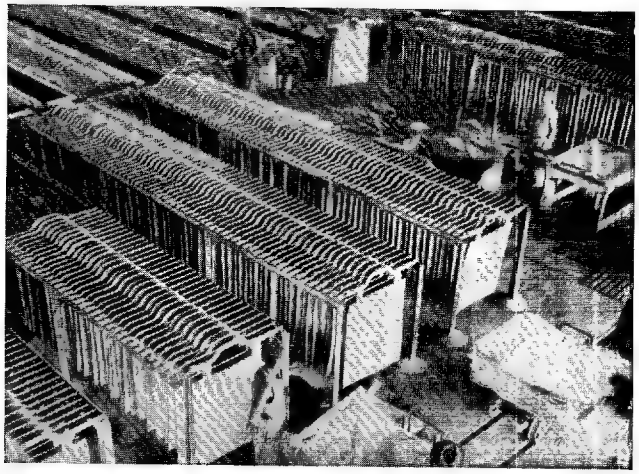
The cathode copper, while very pure, does not possess the characteristics required for its industrial use. It must be refined. This operation is carried out in a reverbatory furnace, whence the refined copper is cast, on casting wheels, into ingots of standard commercial shapes. The copper content of the final products is over 99.95 per cent.

The clear solution containing 55 to 60 grams of copper per liter is passed along to the electrolytic section.

Electrolysis is carried out in a series of 160 concrete tanks, 62 feet long by 3-1/4 feet wide and 4 feet high. In these tanks, the copper contained in the solution is deposited, through the action of an electric current, on thin copper sheets known as starting sheets. The copper sheets or cathodes formed by the deposition of copper from the solution are refined on the spot in a building



The ingots of electro copper are very closely inspected the minute they come off the casting wheels.



The starting sheets, which serve as cathodes in the electrolytic tank building, are produced in a special section of the plant.

The electro copper is stored in lots ready for export.

equipped with three furnaces, each equipped with a casting wheel of the Walker type.

Copper is thereby obtained in the form of a product suitable for immediate industrial use, its copper content being better than 99.95 per cent.

The Shituru installations cover an area of 44 acres with 24 miles of roads.

Supplied with concentrates assaying 20 to 30 per cent copper, these plants have a capacity of 100,000 tons of electrolytic copper per year.

The starting sheets are produced in a special section of the plant.

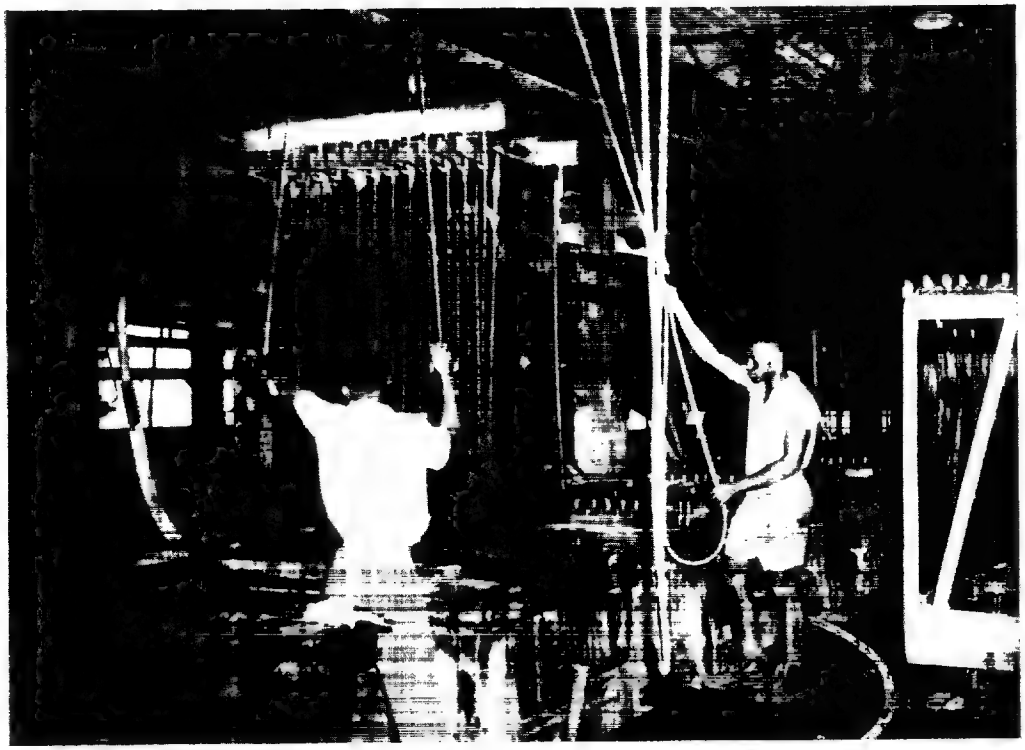
The acid required for the electrolytic plant is produced on the premises in a plant belonging to Sogechim, a subsidiary of Union Minière, mention of which will be made later.

Cobalt Electrolysis. — Certain Katanga copper ores also contain cobalt.

The cobalt is recovered from these ores through two distinct methods, as follows :

1. By an electrolytic process,
2. By smelting in electric furnaces.

The ores or concentrates which are poorest in cobalt are sent to the electrolytic copper plant. The cobalt enters into solution simultaneously with the copper. Bleeding of the solution makes it possible to maintain its concentration in the copper circuit below a determined value. These withdrawals are submitted to special treatment in order to recover the copper and the cobalt.



During the leaching operation, the cobalt dissolves at the same time as the copper. It comes out in the reject solutions of the copper circuit and is recovered by an electrolytic process. Right, is the electrolytic cobalt building.

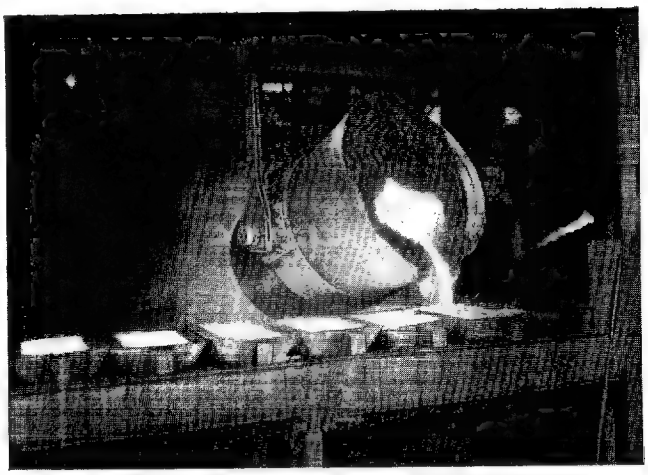
The cobalt, like the copper, is produced in the form of cathodes.

The perfecting of cobalt electrolysis on an industrial scale was achieved in the company's laboratory. It called for the solution of very complex metallurgical problems.

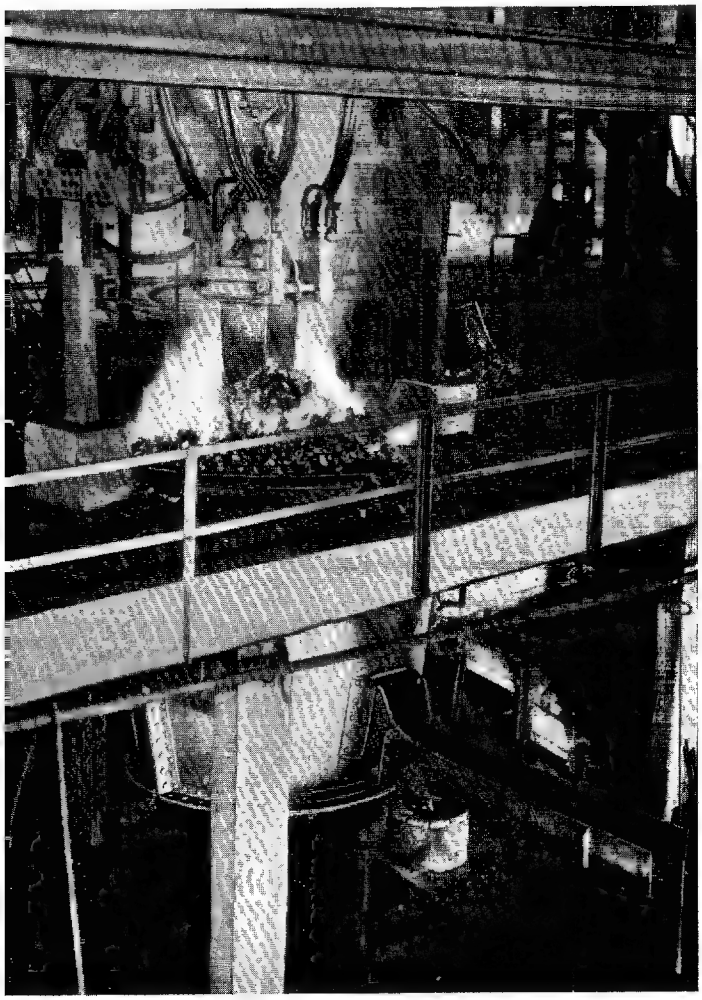
The cobalt cathodes are melted and refined, following which the cobalt is granulated. It is sold in this form after being packed on the spot in drums for export.

Electric Cobalt Furnaces. — Six electric furnaces of 720 Kw. each were installed at Panda for treatment of the richest cobalt ores.

They are single-phase electrode furnaces, 9 feet in diameter. They treat previously sintered concentrates and straight cobalt ore.



The white alloy, containing about 45 per cent cobalt, is cast into ingots which are sent to Belgium and the United States for refining. The red alloy is treated on the spot.



A new 2,000 Kw. furnace has recently been installed.

By melting the charge in a reducing atmosphere, the cobalt, copper and iron contained in the former are released in liquid form.

Due to the difference in density, the liquid metals separate into two layers. The red alloy, rich in copper and poor in cobalt, is treated at the Lubumbashi plant while the white alloy, rich in cobalt and iron but still containing about 15 per cent copper, is sent to the Oolen plant in Belgium for the separation of the cobalt and the copper.

The Central Workshop. — Apart from the repair shops attached to each plant to take care of emergency or ordinary repairs, Union Minière has installed a Central Workshop at Panda. It is

The cobalt-rich ores and concentrates are melted in six electric furnaces. The cobalt and copper so obtained blend with other metals contained in the charge to form two alloys, a white alloy with a high cobalt content and a red alloy in which copper predominates.

a fully equipped metallurgical shop capable of undertaking major repairs and construction work.

The Central Workshop at Panda includes :

A foundry equipped with electric and Morgan furnaces capable of turning out 500 tons a month of cast iron, steel, bronze, and special alloy parts.

A mould and pattern shop with electric drying furnaces adjoining the foundry.

A machine shop equipped with numerous machine tools.

A forge and boilermaker's shop.

These buildings cover an area of over 12 acres, the halls alone covering an area of 135,000 square feet.

Auxiliary Services. — The Panda plants also include important auxiliary services among which the following should be noted :

An electric repair shop.

A plant for the production of oxygen through the liquefaction of air.

A coal pulverizing installation.

A reserve 47,000 HP steam power plant.

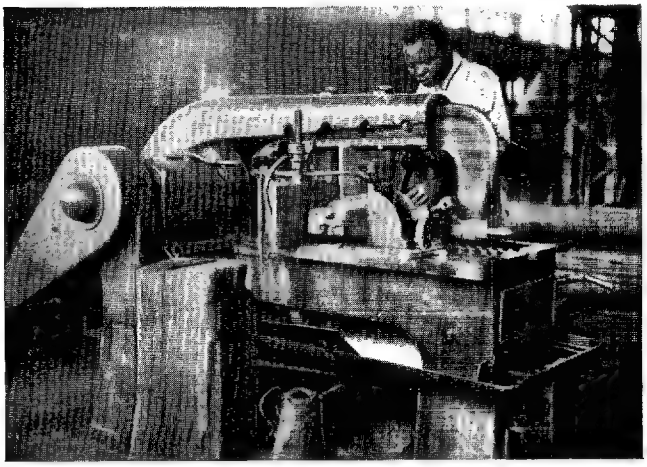
A number of pumping stations for supplying water to the plants.

Foundry casting molds are produced at the Central Workshop by native workers.

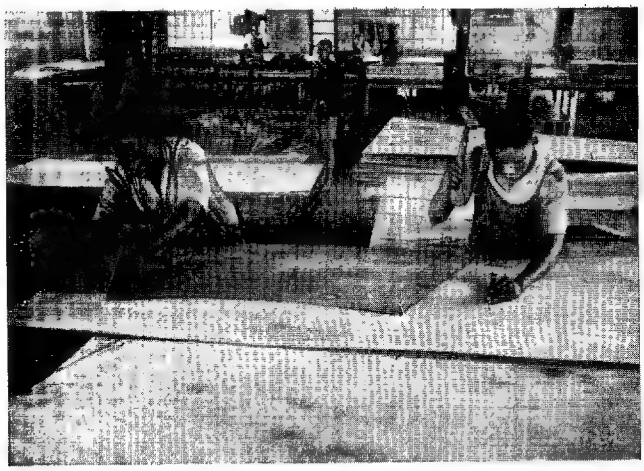
Water from the Panda River is pumped into a series of six reservoirs, the highest of which is 525 feet above the level of the river.

There is also a lead plant which uses as raw material the crude lead recovered from the Sudkat orebody.

The machine shop is equipped with a large number of machine tools.



A metallic saw in the machine workshop.



Tracing room in the boilermakers' section.

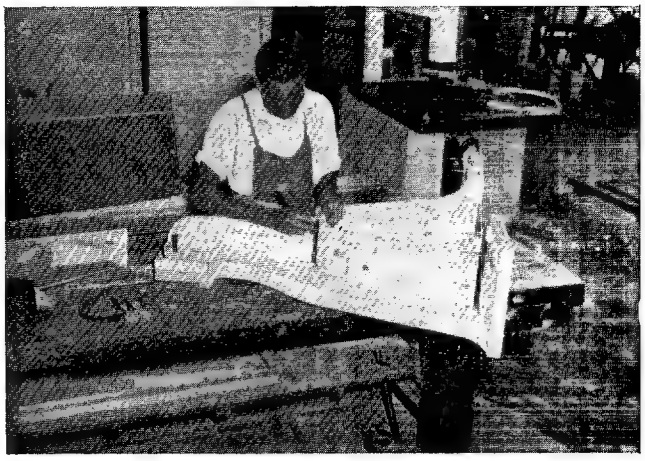
The Research and Testing Laboratory. — The great variety of ores treated in the concentrators and the constant evolution of metallurgy have and still necessitate, the study of new methods of concentration and the development of new metallurgical processes, some of which were developed in Union Minière's plants, as for example, the electrolytic process for the production of cobalt. The engineers in the Research Department have available, at Jadotville, all the necessary laboratory equipment and material required for their work. New and specially designed buildings have recently been put into service. These engineers enjoy the benefit of past experience and are inspired by the most up-to-date techniques in their particular fields.

The Kakontwe Operations

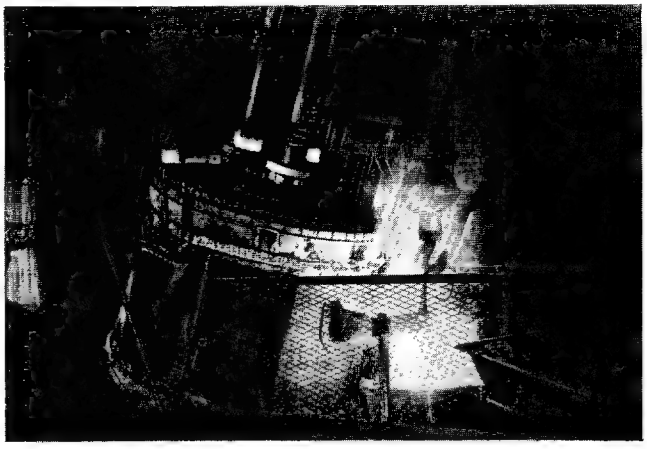
The Union Minière center of operations at Kakontwe comprises three sections, the products of which are used by the company in the Katanga.

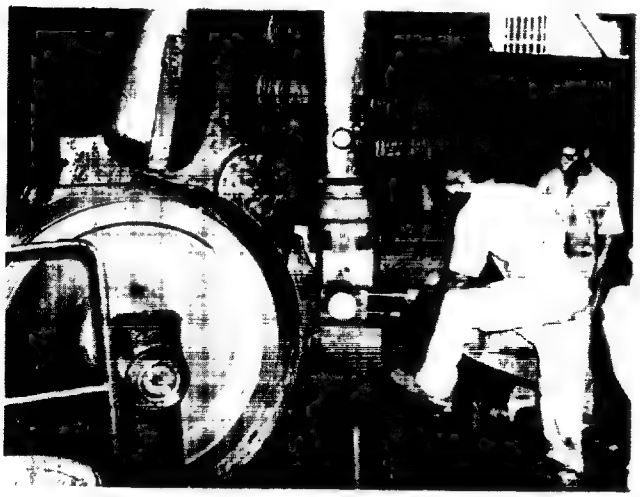
1. The limestone quarries supply all the limestone needed as a flux in the metallurgical fur-

Designer's layout at the Central Workshop.



Central Workshop. The foundry section comprises several electric furnaces for the casting of iron and bronze parts.





An 880-pound power press installed in the boilermakers' section.

naces, as well as crushed stone, building stone, ballast, etc.

2. A battery of lime-kilns supplies the lime used as a flux in the electric furnaces and for building purposes.

3. Brick plants supply the refractory bricks required for the construction and maintenance of the chemical and metallurgical furnaces and also make available ordinary building bricks.

THE PRODUCTION OF PRECIOUS METALS

The above-described installations, which are concerned with the production of Union Minière's copper, cobalt and zinc concentrates, also produce precious metals, viz., the silver and gold contained in varying amounts in the ores treated. The precious metals are concentrated either in the Lubumbashi blister copper or in the leaching muds of the Shituru electrolytic plant, according to whether they derive originally from sulphide or oxidized orebodies. In any event, their recovery is effected in Belgium at the Société Générale Métallurgique de Hoboken plant.

ELECTRIC POWER

The Francqui Power Plant

The electric power supplying both Union Minière's plants and the public utilities which are tied in with its power network has been assured since 1930 by the Sogefor-owned Francqui power plant at Mwadingusha.

This hydroelectric plant utilizes the water of the Cornet Falls, 370 feet high on the Lufira River. Harnessing of this water is achieved by means of a dam, 1,800 feet long by 36 feet high, situated upstream from the falls. It creates a lake or reservoir, holding over 240 billion gallons, from which the water is diverted through a 2,300-foot long channel to a point 360 feet above the generating plant on the left bank of the valley. The water is fed to the latter through three conduits.

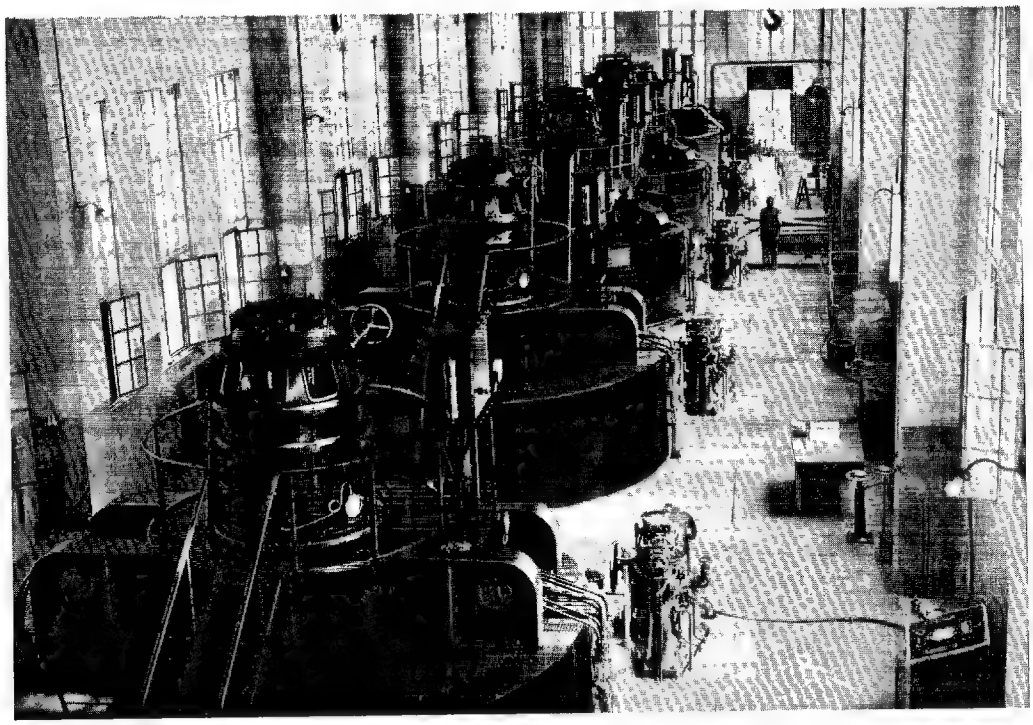
The power plant consists of five turbo-generators, developing 80,000 HP and supplying three-phase current at 6,600 volts.

The building of this powerful station, by stages, in the heart of Africa, necessitated considerable engineering and construction work, rendered possible through the construction of a special railroad 37 miles long, but since dismantled and replaced by a road.

In order to transmit this electric power to required points, the current is raised to 120,000 volts in a sub-station equipped with five groups of three single-phase transformers of 4,000 to 4,400 Kva.

Plant expansions and increased mechanization have necessitated increased quantities of electric power. Thus, the output of the Francqui power

Planing a copper contact bar.



The Francqui hydroelectric station built at the Cornet Falls on the Lufira River, about 38 miles from Jadotville, supplies, since 1930, power needed by Union Minière's plants; it develops 80,000 HP. Right is a view of the turbo-generators of this powerful station.

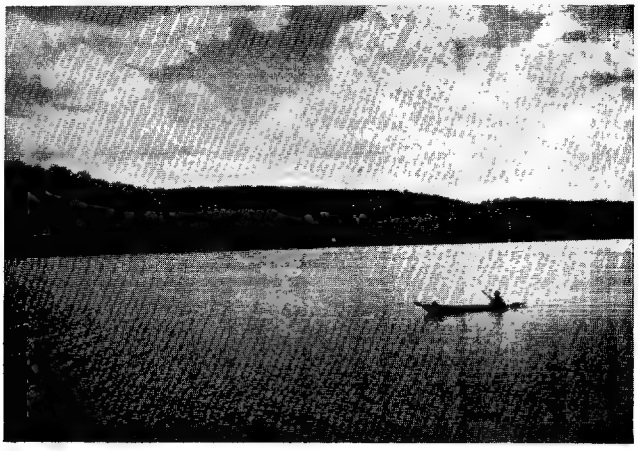
plant in 1931, its first year of operation, was only 140 million Kwh. In 1939, it had already exceeded 250 million Kwh. The war period necessitated still further increases of electric power for the plants, so that in 1947 this station produced more than 400 million Kwh.

The Bia Power Plant

Since the electric power produced at Mwadingusha had become insufficient, a second hydroelectric plant was built at Koni Falls, a little less than 5 miles below the Cornet Falls, thus adding another stage in the harnessing of the Lufira River.

This plant, named the Bia Plant, is equipped with three groups of turbo-generators (one of which is kept in reserve), representing a delivered output of 42,000 HP.

The Francqui and Bia stations are jointly capable of producing a maximum of 630 million Kwh. per year. The present production schedule will not call for an increase in this figure until 1954, at which time the new group of plants at the Western Mines are expected to enter into operation. At that time, power requirements will vary between 700 and 750 million Kwh. per year, to be increased eventually to 900 million Kwh.



The Bia hydroelectric plant, 42,000 CV, was built with a view to furnishing the additional power needed for the further development of Union Minière's installations. It began operation early in 1950. Left, is a panorama of the artificial lake created by this plant's dam.

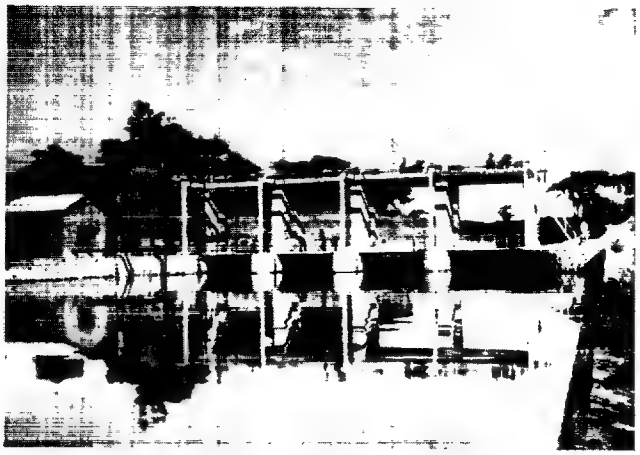
The water is brought from the lake to the plant through an open canal which is increased in length by an underground passage and a syphon. The right view shows the junction of this passage with the syphon at the time of its construction. The canals and conduits leading to the plant have a total length of slightly under one mile.

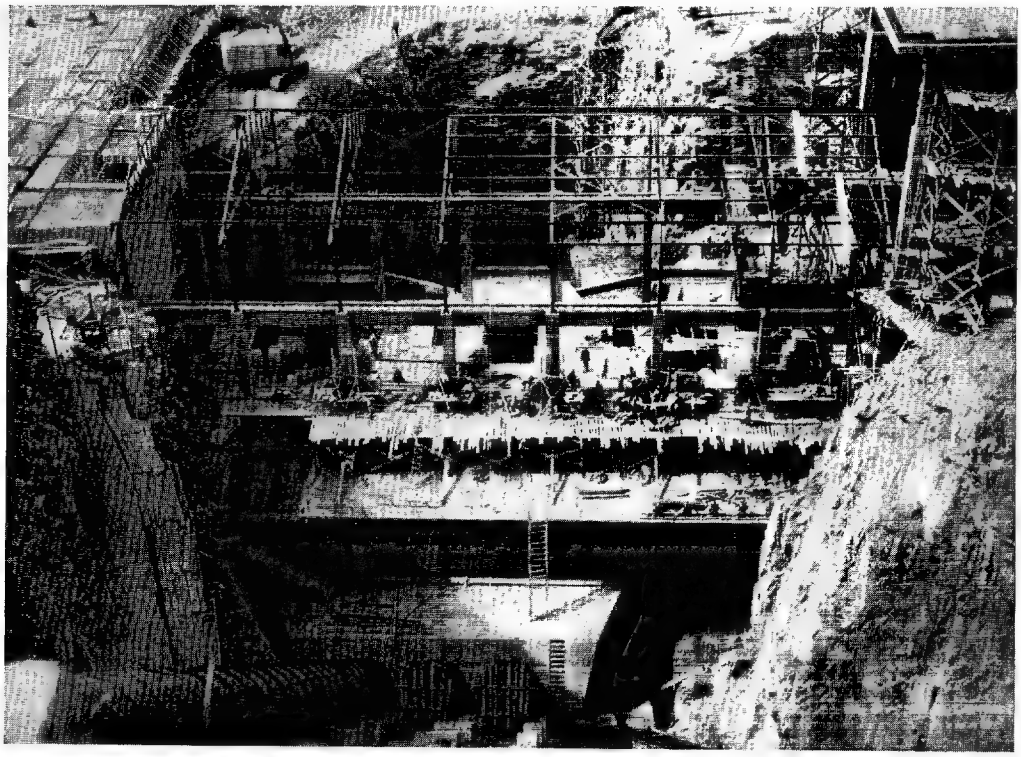
THE DELCOMMUNE POWER PLANT

In view of the above, the construction of a third power plant had to be foreseen. A site was chosen at the Zilo Gorge on the Lualaba River. The rapids at this point are located about 16 miles from the Kolwezi sector. A plant will be built at this location which when completed will consist of four turbo-generator sets (one of which will be kept in reserve), developing 40,000 HP each, or a total of about 160,000 HP, thereby ensuring an additional annual production of up to 500 mil-

The overflow from the lake flows over a spillway into the river below.

Water for the turbines is drawn from the lake by an intake shown below.





The Bia plant building. In order to obtain the highest possible head of water, the plant was built deep down as shown left.

lion Kwh., with added advantage of being able to use one river independently of the other where the two existing plants are established.

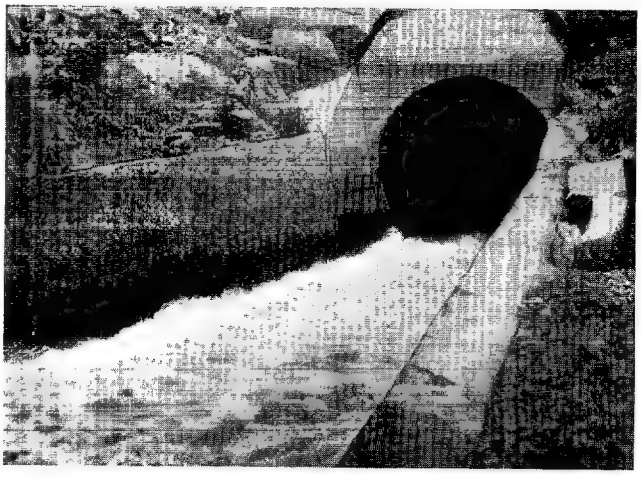
Preliminary construction work at Zilo was started in 1949, and according to estimates, the plant should have two generator sets operating as early as 1952 and should be completed during the course of the following years.

With these three plants in operation, Union Minière will thus dispose of between 750 and 1,150 million Kwh. per year, depending upon the amount of rainfall.

Reserve Steam Plants

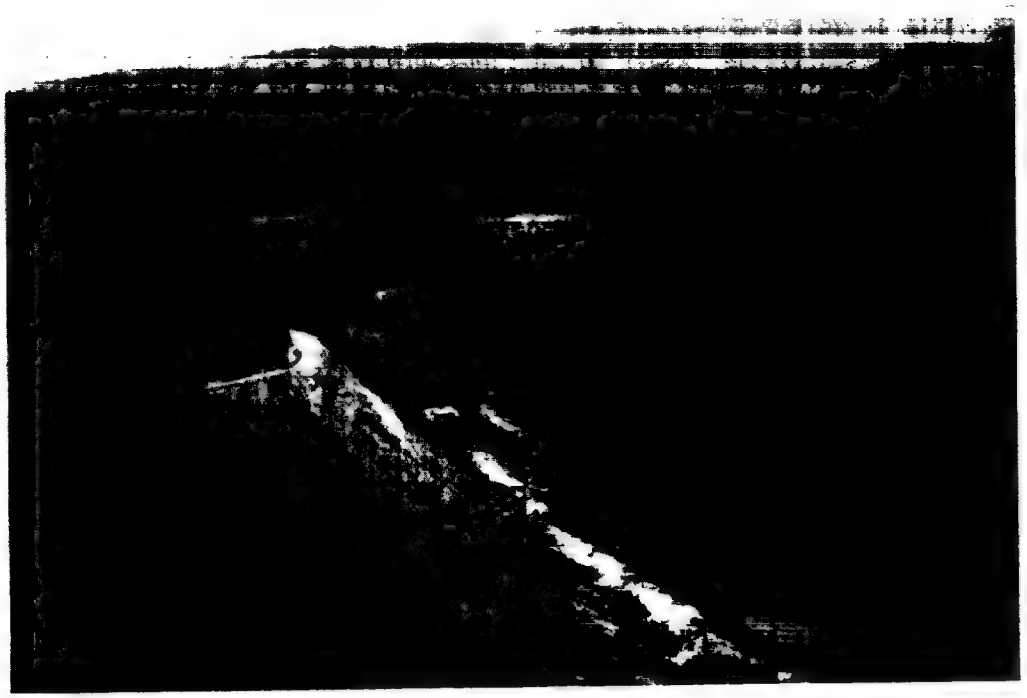
There also exist two steam power plants, one located at Jadotville and the other at Lubumbashi. They formerly supplied power prior to the construction of the first hydroelectric plant and are now held in reserve, having proved most useful as auxiliaries, particularly during years of scant rainfall.

The Jadotville plant is equipped with two turbo-generators of 17,000 HP and two of 6,750 HP, i.e. a total installed capacity of 47,500 HP. Steam is supplied from four boilers fired by pulverized coal and having a heating surface of 7,000 square feet, with fuel economizer and water-screen.



At the Bia power plant an underground tunnel has been dug from the lake directly to the river below the power plant; it can drain off the lake in case of necessity and was used to divert the river during construction of the dam.

A third hydroelectric station, the Delcommune plant, is under construction at the Zilo Falls on the Lualaba River, about 12 miles from Kolwezi. Developing 120,000 CV, it is scheduled to go into operation in 1952. Right, is a view of the location where the new dam will be erected.



In order to drain the new dam site, a channel has been dug along the side of the gorge to divert the river, and a concrete lock has been built which will prevent the water from overflowing into the building area when the river is swollen.

Excavation work in connection with the building of the Delcommune hydroelectric station was started in 1948.

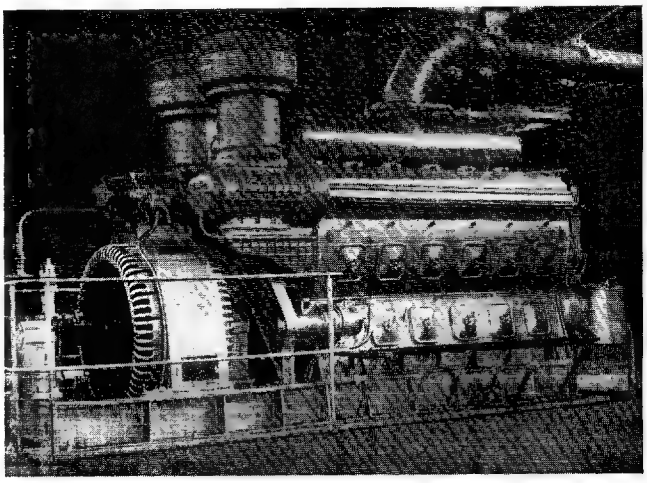
The Lubumbashi plant is equipped with two steam-operated turbo-generators of 2,700 HP and 6,800 HP respectively, the boilers being fired by wood or pulverized coal supplied from a pulverizing plant with a capacity of 200 tons of coal per day.

THE GENERAL SERVICES OF UNION MINIERE IN AFRICA

Apart from the mining and metallurgical operations conducted by the various departments at each of the locations described above, there are also other departments responsible to the company's African Management. These departments comprise a highly specialized personnel, each coordinating in its particular field the many activities upon which depends the fulfillment of the company's production programs.

The Mining Department is held responsible for the general conduct of mining operations and for the prospecting of new deposits.

The Metallurgical Department controls the various metallurgical operations and is responsible for the adaptation of processes called for by the numerous requirements of the programs to



Emergency Diesel-driven electric generators have been installed in the underground mines to ensure a supply of power in case of a major breakdown in normal power supplies.

be realized, the variations in the nature of the ores which must be treated, economic conditions, etc.

The Geological Department is charged with the study of the geology of Union Minière's concessions the search for, prospecting and estimates of new orebodies

The Research Department is charged with the study of recovery processes and new plant projects.

The Design and Construction Department is responsible for the design and plans of new installations, or the extension of existing facilities and the carrying out of construction work in every field.

The Native Labor Department is charged with the recruiting, assignment, administration and general supervision over native workers. This department is particularly responsible for putting into effect the principles adopted by the company with a view to improving the working conditions, food distribution and living quarters of the native workers and their families. The department also keeps in mind the raising of their moral and intellectual level.

The Medical Department supervises the health of the European staff, native workers, and their respective families. It has completely modern hospitals and research laboratories at its disposal for both Europeans and natives.

The Technical Secretariat is charged with taking up with the management all technical questions involved in the company's activities. It includes an Industrial Safety Service directed by an engineer.

The administrative Department includes Bookkeeping, Appropriations and Supplies, Claims, Personnel, Traffic, etc.

V. UNION MINIÈRE PERSONNEL

EUROPEAN PERSONNEL

The operation of the mines, plants and construction yards calls for a large white personnel.

Union Minière employs in Africa some 1,400 whites of every trade. Besides specialized engineers (mining, metallurgical, geological, electrical and machine construction and civil engineers), its personnel includes doctors, technicians, works managers, topographers, chemists, bookkeepers, secretaries, stenographers, compound managers, economists, teachers, etc.

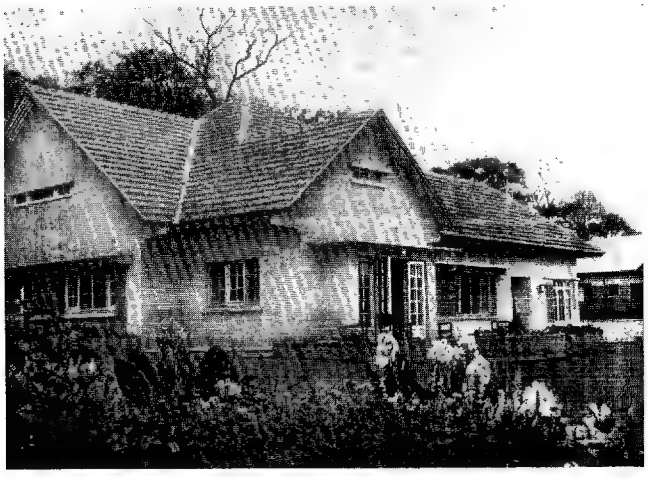
Engineers who are called to a colonial career in Union Minière have an opportunity of developing their technical knowledge and abilities in all branches.

The mining operations and management of the metallurgical plants and their constant improvement continually demand from our engineers the highest degree of knowledge in their profession in order to meet the important industrial problems in which they play their part. They are faced with tremendous material and industrial problems, rarely equalled in Belgium, and thus acquire a degree of knowledge which is the envy of their colleagues back home.

In the category of specialized workers, the company employs mechanics, fitters, turners, machine-tool operators, coppersmiths, mounters, electricians, power-shovel operators, underground miners and mechanics, power-station operators and mechanics, foundrymen, woodsmen, carpenters, bricklayers, etc. Union Minière's equipment and tooling are completely up to date. The worker is able to give full play to his professional aptitudes and generally returns to Europe a better specialist than when he left.

In many cases, the white worker is not called

Union Minière personnel is lodged in attractive houses equipped with every modern comfort.



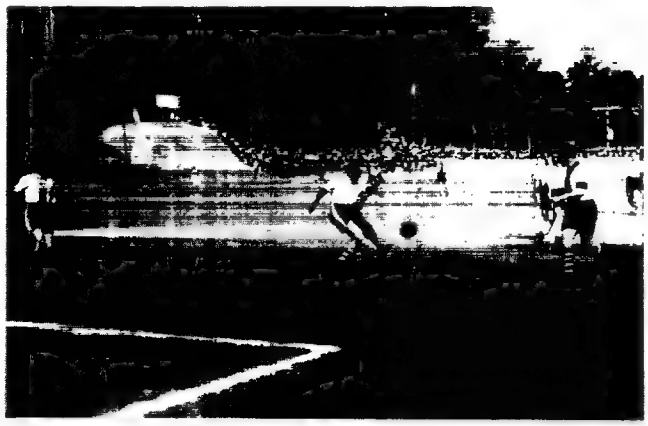
upon to perform routine manual work. His principal assignment is mainly to direct and supervise the native workers and to perform only such work as calls for a high degree of skill. As in Europe, an eight-hour day is the rule.

Union Minière carefully attends to the living conditions of its staff. The houses placed at their disposal fully meet all health requirements and, located in groups, are provided with running water, bath, electricity, and sanitary facilities, including septic tanks or drains.

Sports constitute the principal form of recreation for Europeans in the Katanga. Each, according to his preference, can go in for tennis, football, hockey, basketball, horseback riding, golf, archery, etc. Recreational and sports centers, largely subsidized by Union Minière, have been established in the principal towns. These centers include libraries supplied with a large collection of books, papers, periodicals, a banquet hall, tennis courts, football and sports parks, and sometimes a swimming pool.

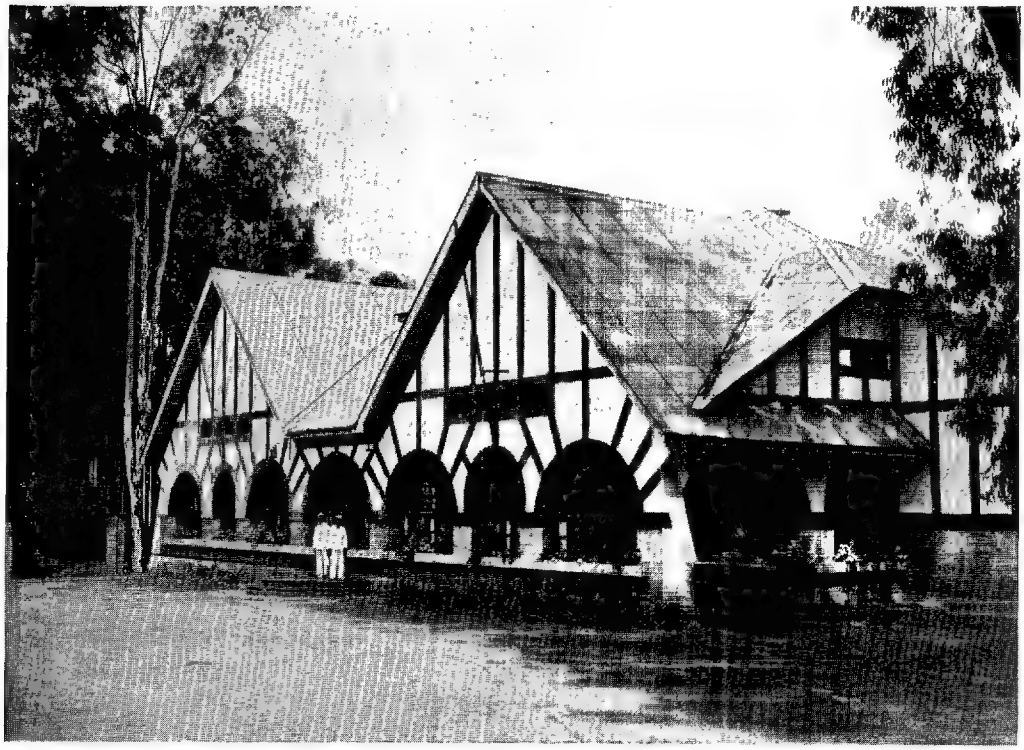
The stores at Elisabethville, Jadotville and Kolwezi are always well stocked with wearing apparel, furnishings and all manner of goods.

In the Haut-Katanga centers, the European's food is almost the same as that in Belgium, and the tradesmen sell a large amount of fresh produce. The vegetable stores located near the housing centers do their best to supply European vegetables the year round. The people living in Haut-Katanga, therefore, are no longer compelled



Football. *The principal forms of recreation for the Europeans in the Katanga are the sports in which they can participate according to their preference : tennis, football, hockey, basketball, swimming, etc.*

Lubumbashi tennis court.



View of Lubumbashi mess hall.

to depend upon canned goods, which previously ruined the health of many Europeans.

The Katanga's moderate climate enables one to dress about the same as during the summer in Europe, although warm clothes are indispensable during certain hours in the dry season.

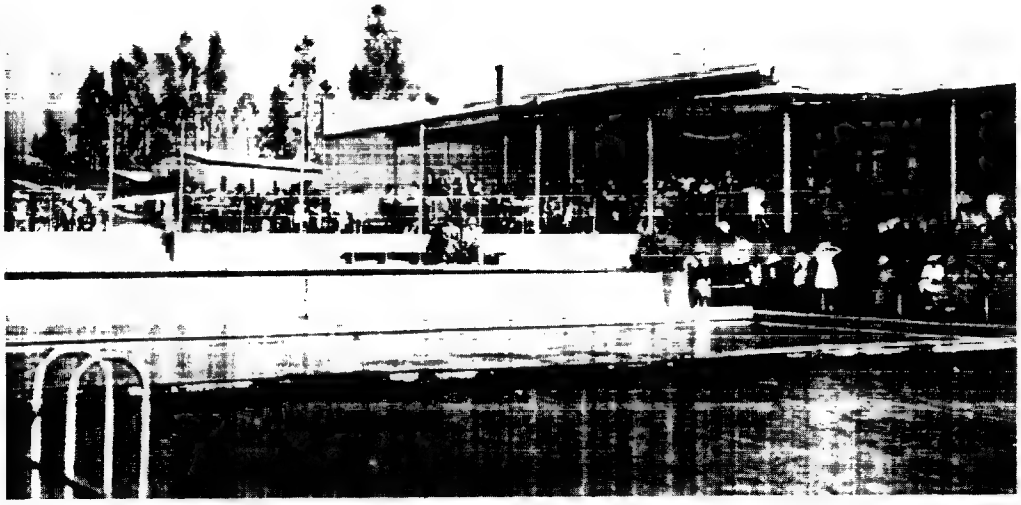
Salaries and fees are higher than in Europe. Besides his straight salary, the employee enjoys free lodging, furniture, water and light, medicines, medical and surgical care. A substantial pension awaits him at the end of his career.

However, it is not sufficient merely to state that the salary earned in one country is higher than in another. It is geared to the cost of living and in this respect, individual tastes and needs make it difficult to be precise. It can be said, however, that in Union Minière's mess, the cost of food is about 2,200 francs a month, not including drinks.

A worker and his wife in the Katanga can live on a monthly budget of from 5,000 to 6,000 francs. This indicates that employees who have been with Union Minière for a number of years can realize appreciable savings by the end of their careers.

Settlements of any importance have a grammar school for the children. High schools, boarding schools and colleges enable the children to follow their studies in the Katanga until they are ready to enter a university.

A Handball match.



"The Zoale" at Jadotville.

NATIVE WORKERS

No industrial enterprise is possible in central Africa without the help of native workers. They are indispensable to the white man.

Union Minière lost no time in realizing the importance of having native workers as specialized as possible. Among the 16,000 blacks employed at present, there are a good number of clerks, nurses and specialized workers : electricians, turners, carpenters and others.

The recruiting and organizing of the colored workers, therefore, are of the utmost importance and it can be said that the development of the copper industry in the Katanga is vitally dependent upon them.

Hiring of Workers

Unable to satisfy its labor requirements from the Katanga alone by appealing to its scant native population which in general is not suited to industrial work, Union Minière had to look for workers in other more populated areas. Native workers of the company have for the most part, since 1926, been coming from the Lomami and Kasai regions, located about 500 miles northwest of the industrial Haut-Katanga.

From the very first contact with these natives, the company is careful to respect their free will. It has established enlistment posts in areas where recruiting is carried on, and the natives come there of their own free will to offer their services. Those who are hired, after selection, subscribe to a three-year contract which is submitted to a government official who makes sure that they are

The scant native population of the Katanga has compelled Union Minière to look for its workers in other regions, sometimes quite far away. At present, it is recruiting part of its labor force in Rwanda-Urundi. Shown hereunder, are some of the new recruits entering a plane which will take them to the Katanga.

fully aware of the terms and conditions of their employment.

Recruiting has recently been undertaken in Ruanda-Urundi. The workers get their first training at Katumba where the company has leased a tin mine for the purpose. Those who have been hired are transported by plane, together with their families, to the Katanga where they first sojourn in a acclimatization camp before starting to work.

Stabilization of Labor

The recruiting and training of these workers involve considerable expense for the company. It is at once apparent that the company realized from the start the importance of stabilizing its native workforce, and to this end it spared no effort.

Stabilization has a most favorable influence on disease death rates and population statistics. It does away with the inconveniences involved in the assimilation of recruits into industrial work, and it makes possible an increase in worker efficiency, in turn resulting in higher salaries and an improved standard of living for the worker.

The professional, medical, social and moral education of the natives, while respecting their freedom and legitimate aspirations, aims above all at their increased welfare and that of their families, and through the care with which they are surrounded, encourages and rewards their efforts towards better work and behavior.

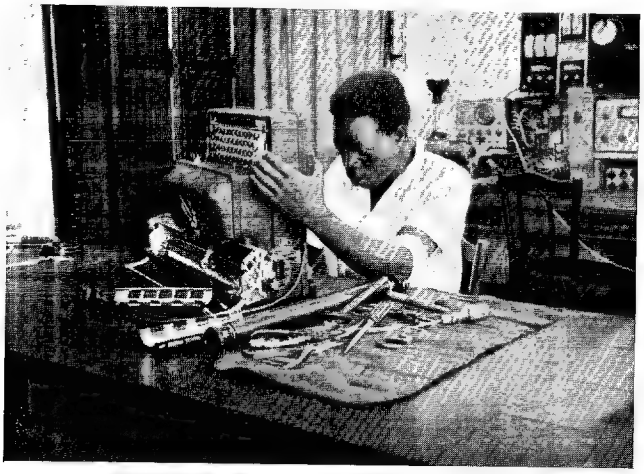
The natives have no difficulty in finding employment upon completion of their studies. The company itself always employs, in its many departments, a great number of clerks and native workers specialized in various fields, such as this electrician servicing an electric calculating machine.

Encouragement of Family Life

Union Minière has done its utmost to encourage family life which forms the very basis of every society. Experience has proven this policy to be

A native operating a Hollerith card-punching machine.

Servicing of an electric typewriter by a native.



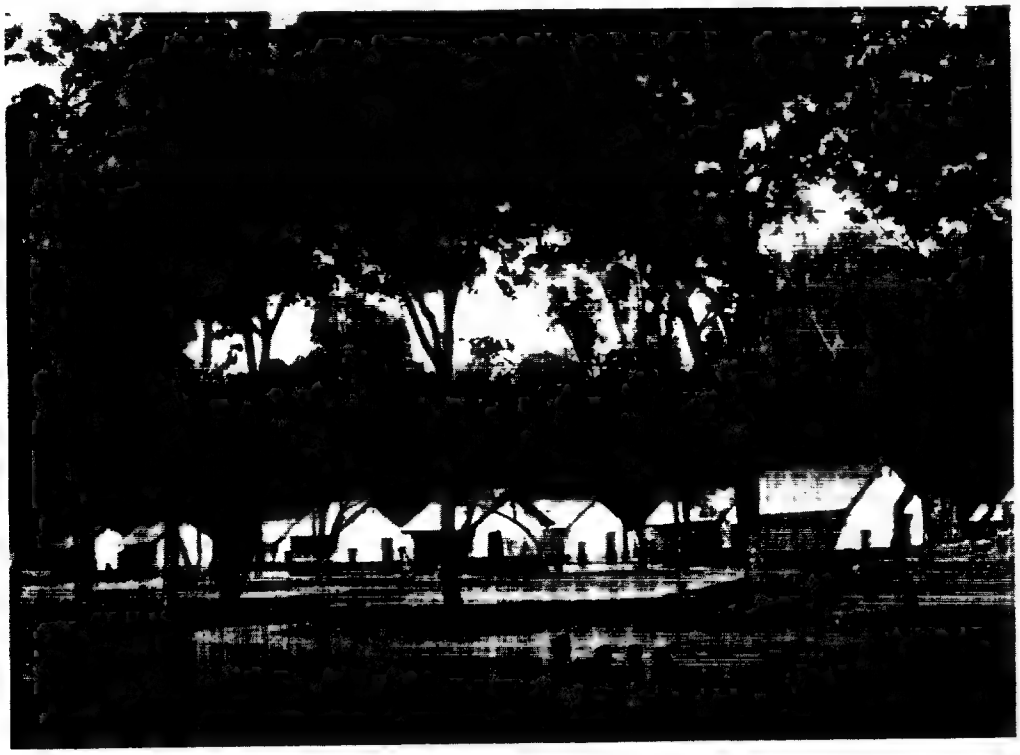
sound because married workers have a better moral and mental outlook than bachelors. Their output is higher, they settle down more readily, and the disease and death rates in their case are lower. Shown below are a few figures indicating the progress and composition of working families and substantiating the above.

Year	Women per 100 Workers	Children per 100 Women
1926	22	32
1930	41	67
1935	50	78
1941	56	105
1945	70	134
1948	73	163

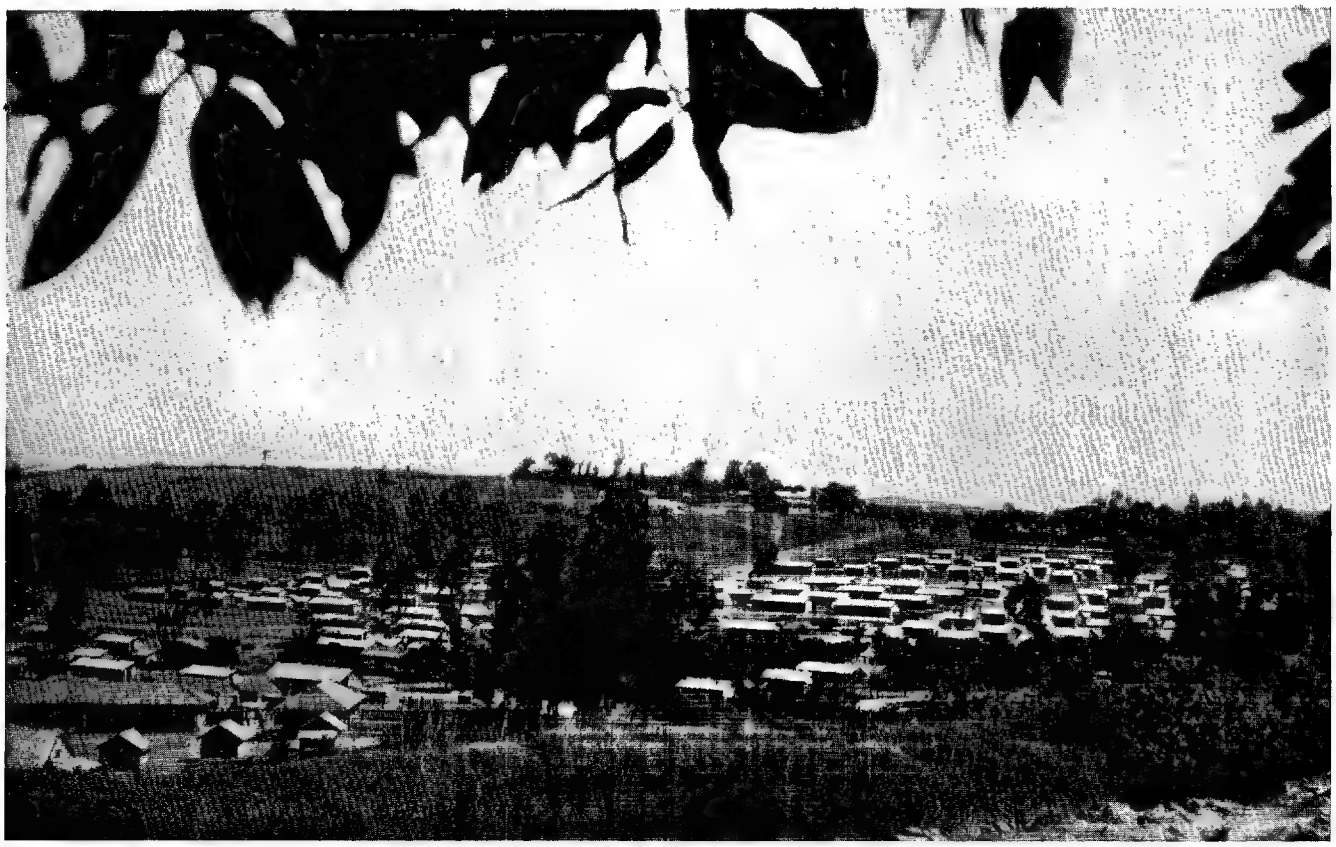
The company's native workers live in houses built of durable materials, with two, three or four rooms, according to the size of the family.

HOUSING

The company sees to it that native houses are built in strict compliance with sanitary requirements. Abandoning community housing systems, it long ago adopted the more costly single houses, made of durable materials, more sanitary and preferred by far by the native. These houses are adapted to the size of the family and the social standing of the worker. Spacious houses of two, three and four rooms are provided for the larger families. Each house has its own fenced-in plot, thus satisfying the native's desire for privacy.



Native houses at Kipushi.



The houses are grouped in large compounds and each house has a fenced-in plot where the native can grow a variety of vegetables, enabling him to vary his menus.

Food

Food supplies for the workers are generally assured by the company. Rations, established according to the most recent scientific prescriptions, are generous, varied and well balanced. They include sugar, flour and fats for strength, vitamins, proteins and mineral salts such as fresh meat, fresh fish, sweet potatoes, green vegetables and fruits, milk and cod liver oil for children. A pregnant or nursing woman receives double rations, and children, in addition to their usual rations, receive special meals in the dining halls. Additional hot meals are also served to the underground miners.

Medical Supervision

During the entire period of their employ at Union Minière, the workers as well as their families are subject to medical supervision. Immediately upon their arrival in the Katanga, the recruits and their families undergo a medical examination which includes vaccination, delousing and treatment for chronic diseases.

Each native is given a medical card which is kept up to date during his stay at Union Minière, and on which is shown all pertinent information.

The new recruits are gradually and progressively put to work under medical supervision and the doctor decides at which point they can be assigned to regular groups, and what type of work they are to be assigned, based upon physical ability. The doctor keeps a permanent check on sanitary conditions in the mines and plants and on the physical fitness of the workers.

Medical Care

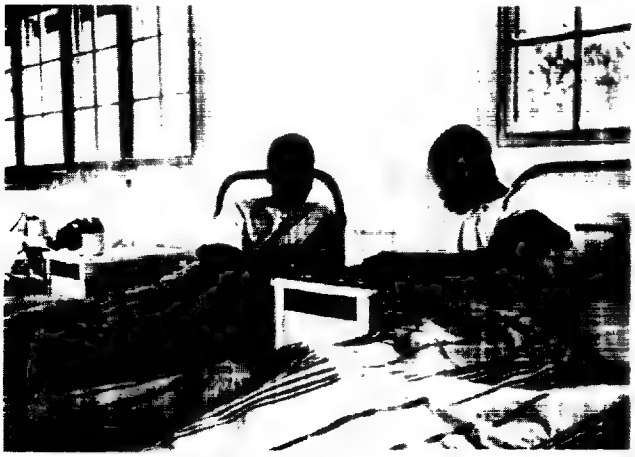
Union Minière did not hesitate to make the necessary sacrifices in creating an indispensable medical department for ensuring this supervision and necessary effective medical care. Each camp

is under the supervision of a doctor who has a completely equipped hospital at his disposal, including a dispensary for daily attendance, bandage room, hospital rooms, isolation wards, operating room, pharmacy, laboratory, microscope room, radiographic equipment, refectory, kitchen, steam laundry, etc. Vaccines are prepared from local cultures in the company's bacteriology laboratory.

Jadotville. — Native hospital. Dispensary. Thanks to Union Minière's unceasing efforts to improve the sanitary conditions of its workers, it has succeeded in reducing the death rate, in 25 years, from 31 °/₀₀ to 3,2 °/₀₀. The company's medical services enjoy the most up-to-date equipment.

" Œuvre de Protection de l'Enfance Noire " (O. P. E. N.)

The ever increasing number of women and children brought about the creation of an organization for the protection of native children, with the object of reducing the rate of infant mortality and the number of still-born children. Its aims are to educate and instruct pregnant women and mothers to look after their health and that of their children.



Jadotville hospital : two natives playing checkers.

The O. P. E. N. is managed by a doctor, assisted by an interne and nursing sisters. It organizes :

Medical examinations of expectant mothers in order to discover and cure any causes which might adversely affect delivery. Every expectant mother

A native assistant pharmacist.

Inner court of the Panda hospital.

is required to attend these periodical examinations.

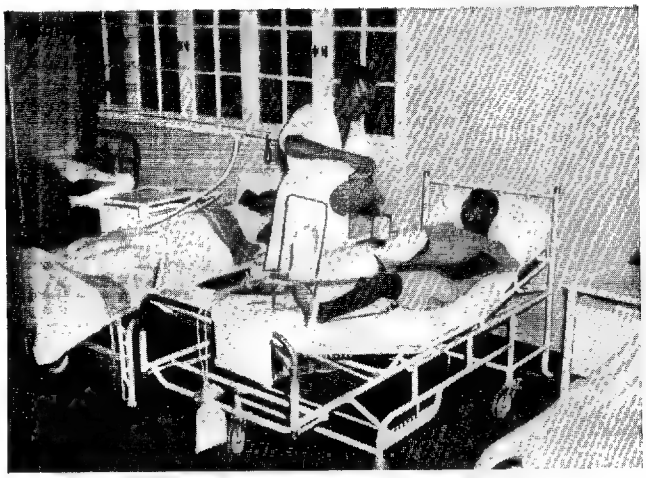
Maternity wards where births take place under medical supervision, complete layettes being supplied by the O. P. E. N.

Examination of babies. The child is bathed, weighed and examined by the doctor; the nurses instruct mothers how to bathe, dress, care for and feed the child; the mothers come in each day to bathe the child in a specially provided section. The young native girls attending housekeeping schools take turns in helping the European nurses and the Nuns, and thus receive excellent training in child-care.

Daily milk distribution for babies when necessary. The babies receive milk and appropriate hot cereals each day.

Medical consultations once or twice a week for children 3 to 5 years old.

Medical supervision of children during their entire stay in Union Minière's schools. Here again the doctor decides what work should be given them when they reach the age of 16 or 17.



The Jadotville hospital for natives, built in 1919, takes in not only the natives employed by Union Minière but also those of neighboring areas.

The encouragement of family life, fostered for years by Union Minière, has resulted in an increasing birth rate at its mine and plant sites. A foundation for the protection of native children (O.P.E.N.) watches over the children's growth and helps those native mothers not too familiar with their care.

The following figures show the results obtained, thanks to the O. P. E. N. :

Year	Approximate number of households	Yearly birth rate per 1,000 households	Yearly birth rate per 1,000 inhabitants	Still-born death rate per 1,000 births	Death rate per 1,000 children	Annual population increase per 1,000 inhabitants
1929	5.817	153	33	115	102	— 1,5
1934	3.612	116	30	50	53	+ 13
1939	6.928	162	45	44	38	+ 29
1943	12.208	194	51	46	31	+ 36
1947	11.581	212	54	29	42	+ 40
1948	11.802	245	61	26	27	+ 51

An especially high tribute must here be paid to the Nuns for their great services. They are unsparing in their time, efforts and devotion to the good work which they perform in the company hospitals to which they are attached.

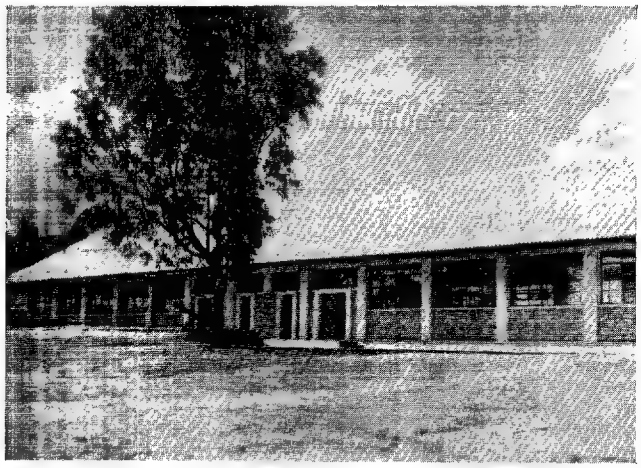
Thanks to the efficient coordination of all these efforts, Union Minière has been able to obtain extremely favorable results in reducing the disease and death rates among the native population.

Jadotville motherhood school. The child population in Union Minière settlements is no less than 20,000, a good number of whom are of school age. The company takes care of the education of youth from kindergarten to adulthood.

The native mothers bring their children once or twice a week to a nursery, where the children are washed, weighed and thoroughly examined by doctors.

The distribution of milk and hot cereals is organized under the patronage of O. P. E. N. Thus child-feeding is scientifically controlled.

The Missionary Sisters contribute in large measure to the success of the company policy of family care and they lend it their untiring devotion.



New school buildings are constantly being erected. Shown here, is the Jadotville preprofessional school workshop.

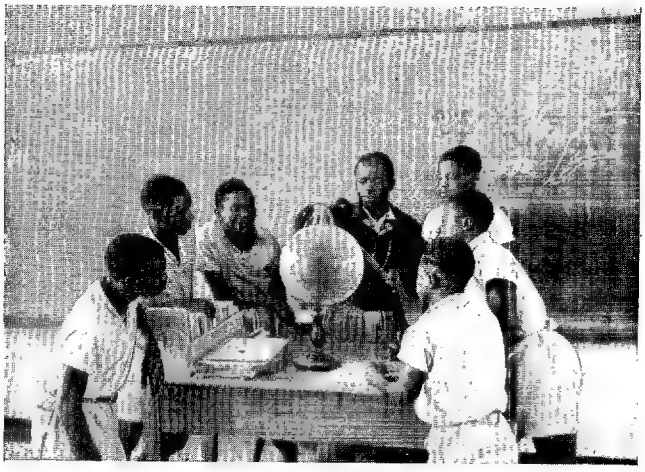
Education of Children

Because of the great increase in the birth rate, Union Minière has had to face the problem of educating an increasing number of children each year. In order to meet this situation, it was necessary to create a sub-division in the Personnel Department, charged exclusively with the education of the children. This sub-division manages a number of schools which teach more than 7,000 children, constituting the entire child population of Union Minière's schools for natives. A compulsory educational system is in effect which specializes in the trades, with emphasis on the child's natural abilities.

It affords an education which enables the most gifted and deserving to attain qualified positions.

Concrete methods are the only ones likely to produce results, and more so in the case of native children than of Europeans. Their first knowledge is imparted during such games as are capable of holding their attention.

Geography lesson.



The guardians and native teachers educated in company schools are already playing an important part in the work of our educational organization. They thus contribute to the evolution of their own people towards a better standard of living.

The native language spoken in the school during the first few years is however unsuited for more advanced lessons and is gradually replaced by the french language in the upper classes.

Young girls are given an education which qualifies them for family life and at the same time makes good mothers and good wives of them.

During the course of their studies, a selection is made from among the pupils. The more gifted will be given an opportunity to enter high school, which will prepare and enable them to swell the ranks of the school personnel. Others, such as the apprentice carpenter in this illustration, will enter the trade school.

The health of the children attending the company schools is the object of constant care, and physical culture forms an integral part of the educational program.

Social Security

The same motives which prompted the creation of Social Security in our own countries gave rise to an advanced system of Social Security for the benefit of the employees in Union Minière.

Far outdistancing legislation in this field, the company has established a complete system of sickness and disability benefits, granting outright indemnities and lifetime annuities for permanent disability and reinstatement indemnities. The measures taken to assure industrial safety and the stabilization of the workers have considerably reduced disability risks due to accidents or illness.

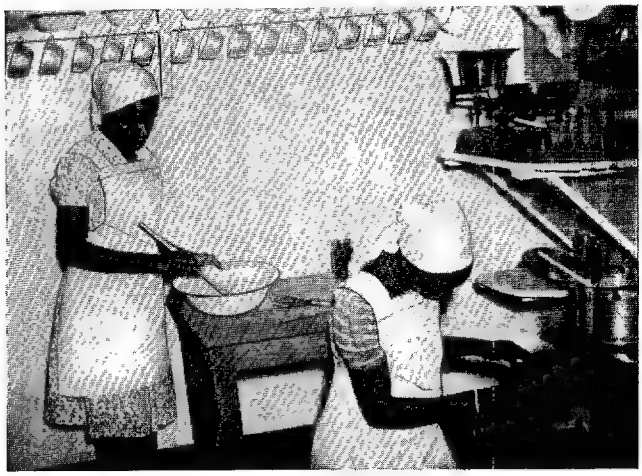
A system of old-age pensions and of reinstallation of those already pensioned has also been introduced. These measures, together with the construction of villages destined to gather together the aged workers who do not desire, as is often the case, to return to their region of origin, have contributed towards developing among the workers a spirit of confidence in the future which is conducive to the establishment of happy homes.

Native guardians and teachers, educated in special schools, help the Missionary Sisters and lay assistants in the educational tasks entrusted to their care. An example is this one watching over a recess at the nursery school.

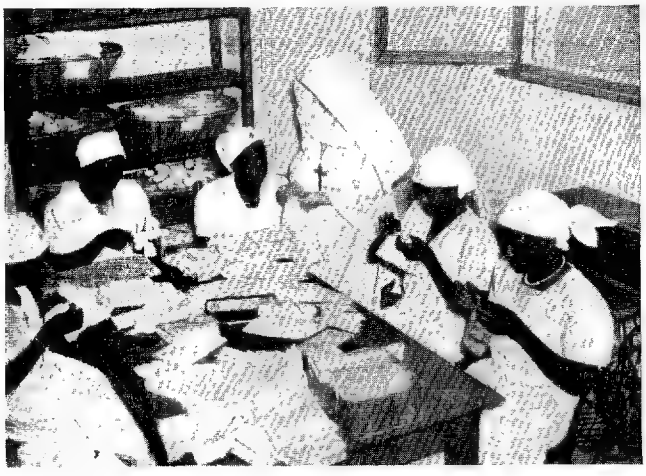
Recreational Activities

Having become part of large industrial communities, the native no longer finds the distractions provided by his life as a savage in the jungle, and he is therefore in danger of becoming dissipated if left alone. Under these conditions, in order to obviate the degeneration of these newly created native societies, it is essential to create such distractions as will interest them during

The education of young native girls is designed to prepare them for the roles of wives and mothers, which they will have to assume in the new native society which is being created. Shown here, is a laundry lesson at the Jadotville housekeeping school.



The education of native women is without doubt the most trying problem in the colony. Union Minière spares no effort in endeavoring to obtain rapid results in this field. Hereunder, is a sewing lesson at the housekeeping school.



A group of children of the Jadotville grammar school for girls.

their leisure time. This was what the company had in mind when developing the following activities in the various camps :

Gardening, in which the natives are encouraged and for which they are supplied seeds, fertilizer and tools. This activity, which enables the housewife to vary her menus, also provides welcome additional money through the sale of surpluses.

Sports clubs, maintained and subsidized by the company, bend their efforts towards forming a number of well trained football and athletic teams.

Not content with educating young native girls only, Union Minière also seeks to complete the training of adult women. Shown hereunder, is a course in knitting set up for this purpose.

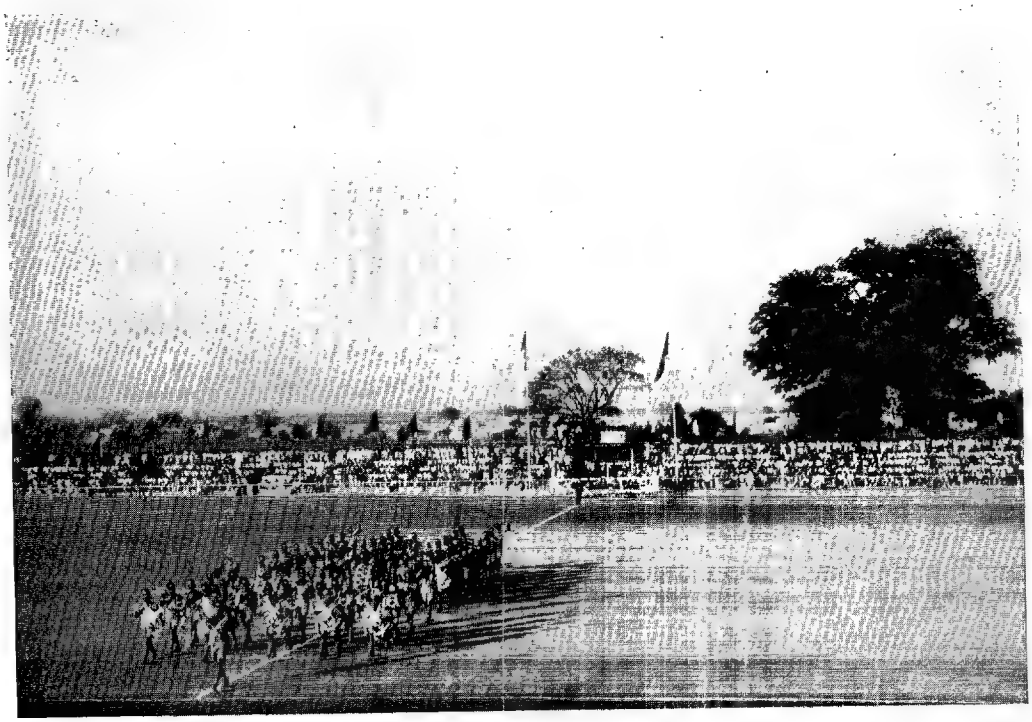
A young native girl at the sewing machine.

A game of draughts.

They organize outings and matches with teams from other clubs and gymnastic meets for children, young boys and workers.

Evening courses, lectures, movies, annual holidays and prizes for achievement round out the activities in this sphere.

In this respect, great efforts have been and continue to be made.



Sports contests of the type organized during the visit of the Rhodesian Football Team, shown at the Victory Stadium in Elisabethville, provide gay and festive occasions.

In order to avoid dissipation in the native cities created by the company, it has organized recreational activities for the workers during their spare time. Many brass band outings are organized, such as the Prince Leopold Mine one shown above.

by the various missionary orders whose activities are increasing in the Katanga.

Already installed in this region since the early years of the advent of the white man, they have largely contributed towards opening up the country to civilization and towards industrial prosperity.

The various orders which are at present carrying out their missions in the Haut-Katanga help to teach the children of the company's employees and those of its native workers, and they also bring to our hospitals the support of their tireless help and devotion.

The Missions

In bringing this chapter to a close, it is only fitting to express a word of gratitude for the valuable and unselfish support given the company

The native is sensitive to appreciation for his good services. With this in mind, Union Minière has created special medals of merit for good and loyal services rendered. The distribution of these decorations, accompanied by the granting of diplomas, is greatly appreciated by the natives.

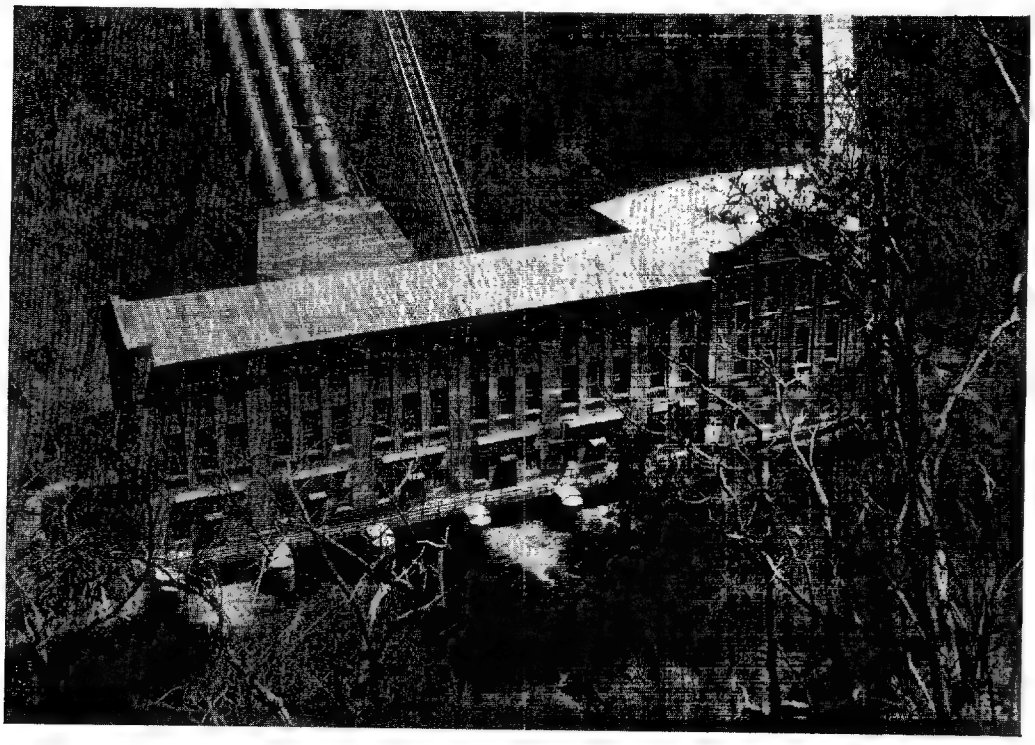
Part three

UNION MINIÈRE SUBSIDIARIES

SOGEFOR

THE USE of the waterfalls in the Katanga as sources of power called for thorough investigation and long and costly construction work. The Société Générale des Forces Hydroélectriques du Katanga, or "Sogefor," was formed in 1925 for the purpose of harnessing the Cornet Falls and to build the Francqui power plant which it owns.

The operation of the Bia power plant at Koni,



The Francqui power plant built on the bank of the Lufira River, 350 feet below the level of the intake. The water is delivered through three steel conduits. Upon its exit from the turbines, the water is discharged directly into the river bed.

5 miles below the Cornet Falls belonging to Union Minière, was likewise also entrusted to Sogefor.

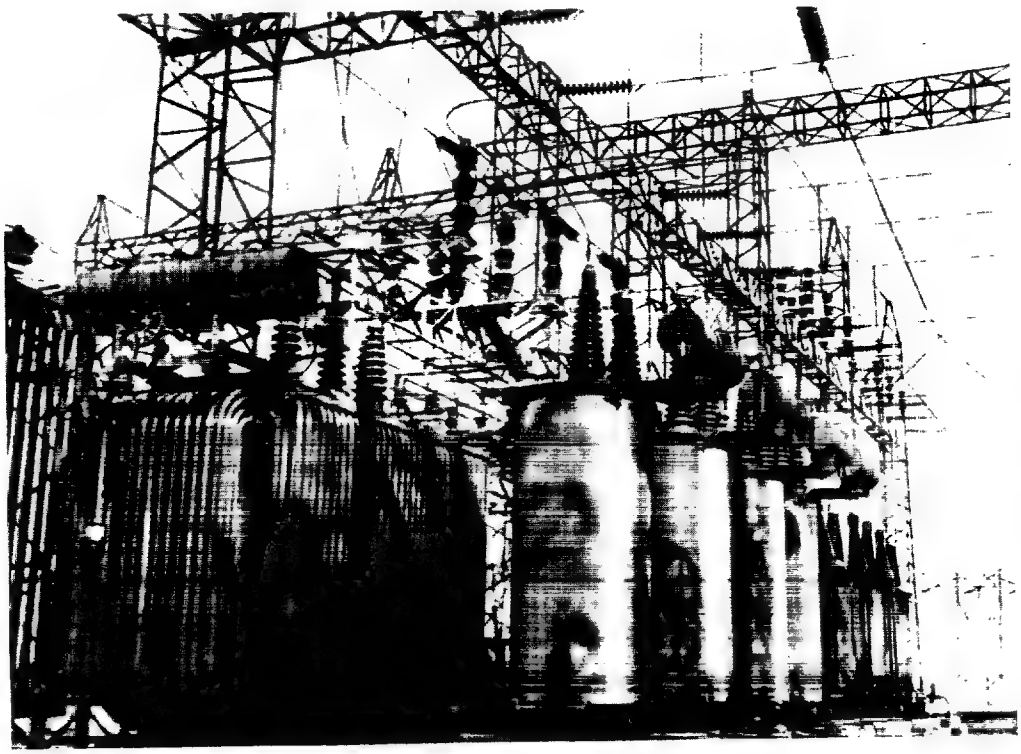
These two plants are linked by a high-tension transmission line carrying 120,000 volts.

Lines from the Francqui plant supply current at 120,000 volts to the towns of Jadotville, Elisabethville and Kolwezi.

SOGELEC

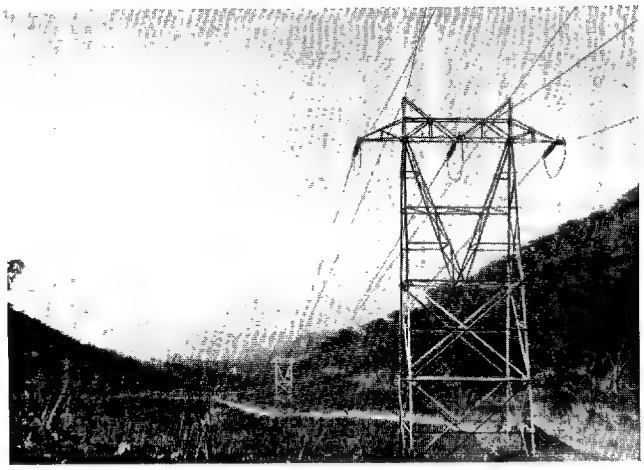
From these points, the power is further distributed through branch lines (50,000, 15,000 and 6,600 volts) to the different consuming points, such as Ruwe, Kambove, Kakanda, Shinkolobwe, Kakontwe, Kipushi, etc. Part of this network belongs to the Société Générale Africaine d'Electricité (Sogelec) with a capital of 80 million francs. These lines cover a distance of 110 miles. If to this are added the Sogefor and Union Minière lines, the Katanga is serviced by a high tension power network of about 438 miles.

Sogelec also insures the distribution of current to the public utilities in Jadotville, Elisabethville, Kipushi and Kolwezi.



The power produced by the hydroelectric plants at 6,600 volts is transformed to 120,000 volts and is transmitted at this voltage to the various distribution centers.

Sogelec operates the transmission lines and transformer stations which it owns. It also ensures the distribution of power to Elisabethville, Jadotville, Kolwezi and Kipushi.



SOGECHIM

The copper industry, in addition to large supplies of power, also requires steady supplies of chemical products. Moreover, the development of the Katanga created new outlets for certain products. Société Générale Industrielle et Chimique du Katanga, or "Sogechim", with a capital of 100 million francs, was formed, also through the initiative of Union Minière, to meet these new requirements.

General view of the Sogechim buildings at Jadotville. Sogechim produces sulphuric acid, sodium chlorate, potassium and caustic soda, zinc sulphates and copper sulphate, hydrochloric acid, fatty acids, etc. It also operates a cadmium refining plant, bottling factory, and an ozone water-sterilization and filtration plant.

Sogechim at present operates the following :

A sulphuric acid plant with an annual capacity of 40,000 tons of acid, employing the " contact " process in which the sulphurous gas, produced either in the zinc-roasting furnaces, or in burners, is oxidized by the air under the catalytic action of finely divided platinum, after which it is absorbed by previously formed acid which it concentrates.

A plant for the production of fatty acids through the hydrolysis of vegetable oils. Its capacity is about 3,000 tons of oil per year, glycerin being recovered as a by-product.

An electrolytic plant for the production of sodium chlorate and caustic soda, as well as a plant for the production of hydrochloric acid.

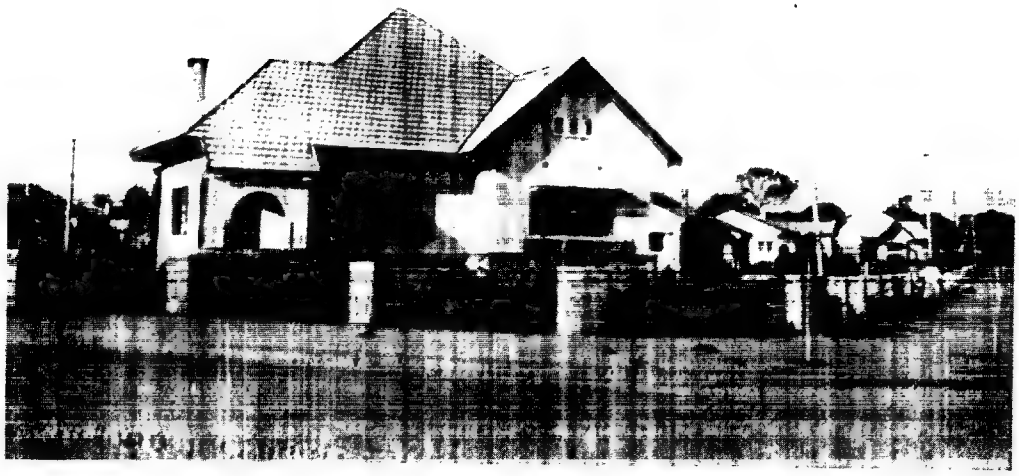
A plant for the purification and sterilization of water by ozone. It supplies Jadotville with drinking water.

A plant for the recovery and production of metallic cadmium from the dusts collected from the roasting gases.

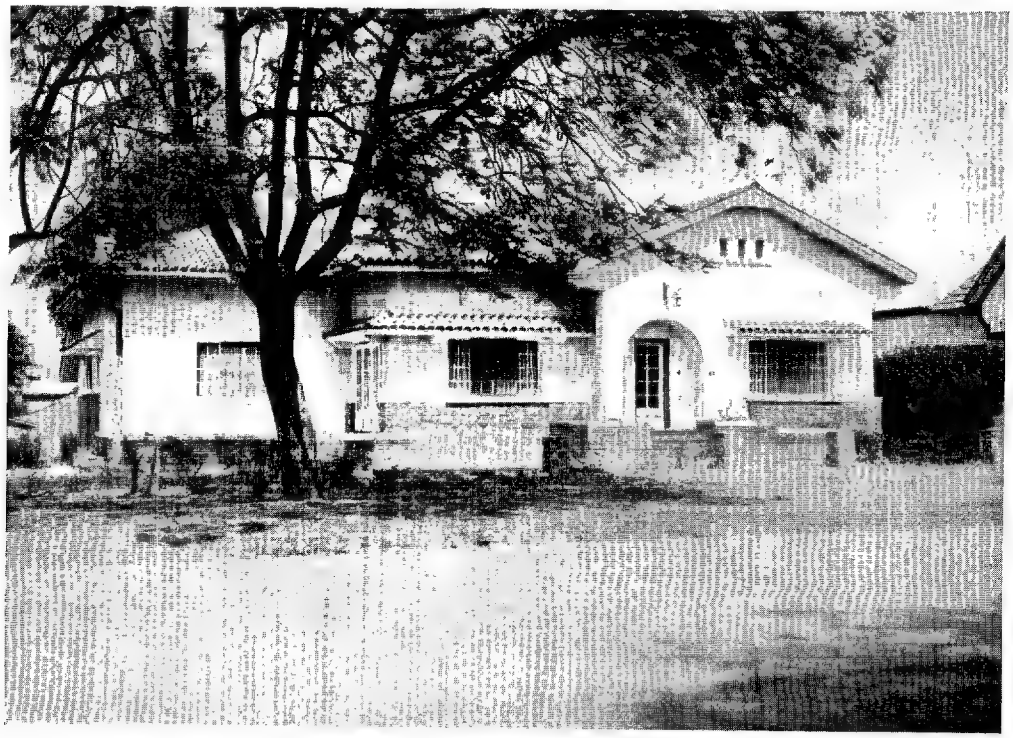
The bulk of these products are consumed by Union Minière, which uses sulphuric and fatty acids in its metallurgical operations as well as sodium chlorate in the production of explosives for mining operations. The rest are sold to local industrial and agricultural consumers, as are also a number of imported products such as chemical fertilizers. These sales are handled by a subsidiary, " Sapchim ", Société Africaine de Produits Chimiques et Industriels, which has a capital of four million francs.

"COMPAGNIE FONCIÈRE DU KATANGA"

The " Compagnie Foncière du Katanga " was created primarily to relieve the large Katanga companies of having themselves to provide housing accommodations for their European personnel.



The Compagnie Foncière builds the houses which are put at the disposal of the European staff and takes charge of their maintenance.



One of the houses built by the Compagnie Foncière.

It builds the necessary dwellings and leases or sells them to the companies. It is responsible for their management and upkeep. It also acts as agent in the Congo of European insurance companies.

The capital of this company amounts to 200 million francs. It owns about 780 houses in Elisabethville, Jadotville, Kipushi and Kolwezi and manages and maintains almost 1,650 other buildings.

"MINOTERIES DU KATANGA" (FLOUR MILLS)

In order to provide its native personnel with the best quality food products, Union Minière formed a company called "Minoteries du Katanga," which deals mainly with the production of corn and cassava flours, the basic foods of the native.

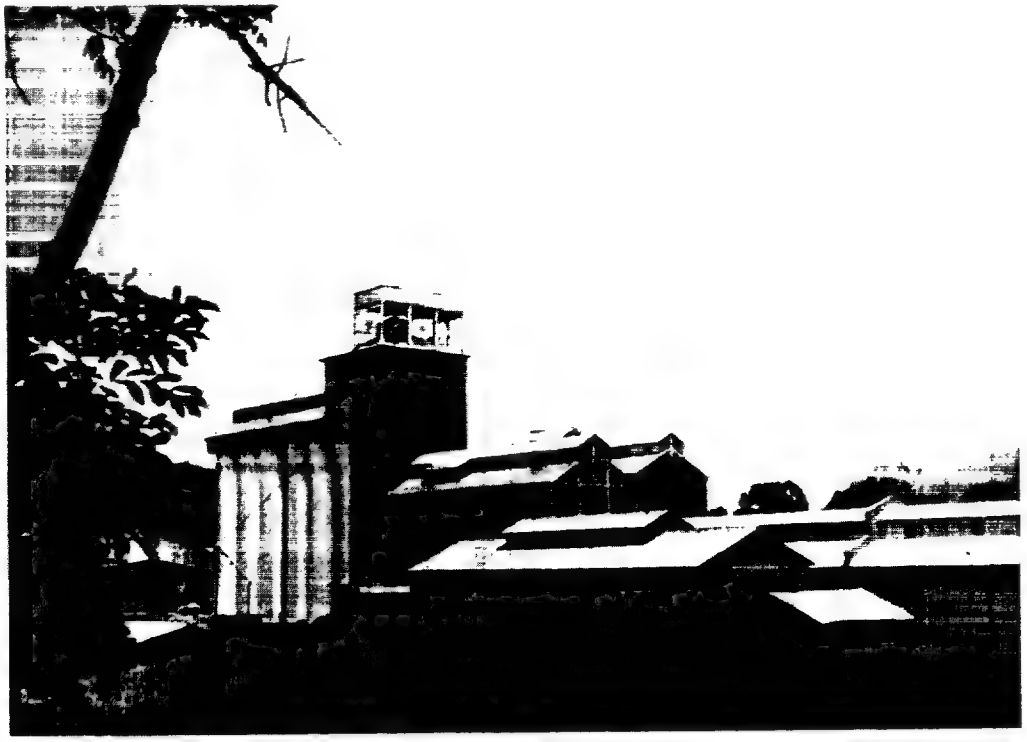
This company operates two modern plants—one at Kakontwe, near Jadotville, and the other at Elisabethville.

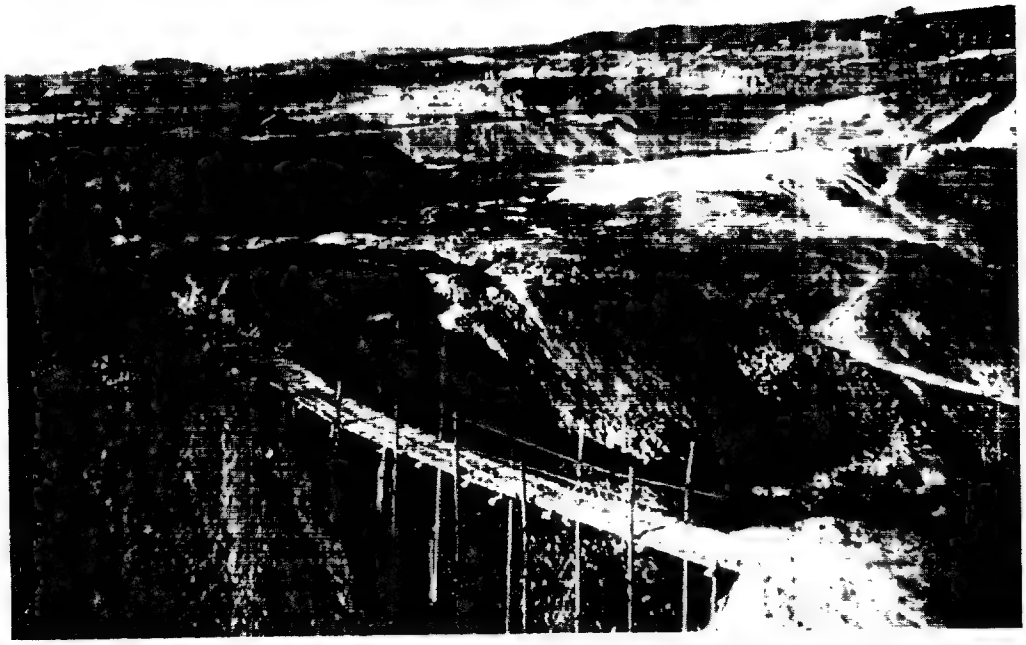
The daily capacity of these mills is 90 tons of corn flour, 37 tons of cassava flour and 10 tons of wheat flour.

The by-products—oil, bran, oil-cake and livestock feed—are supplied to the local market. The plant at Kakontwe also produces a certain quantity of peanut oil and castor oil.

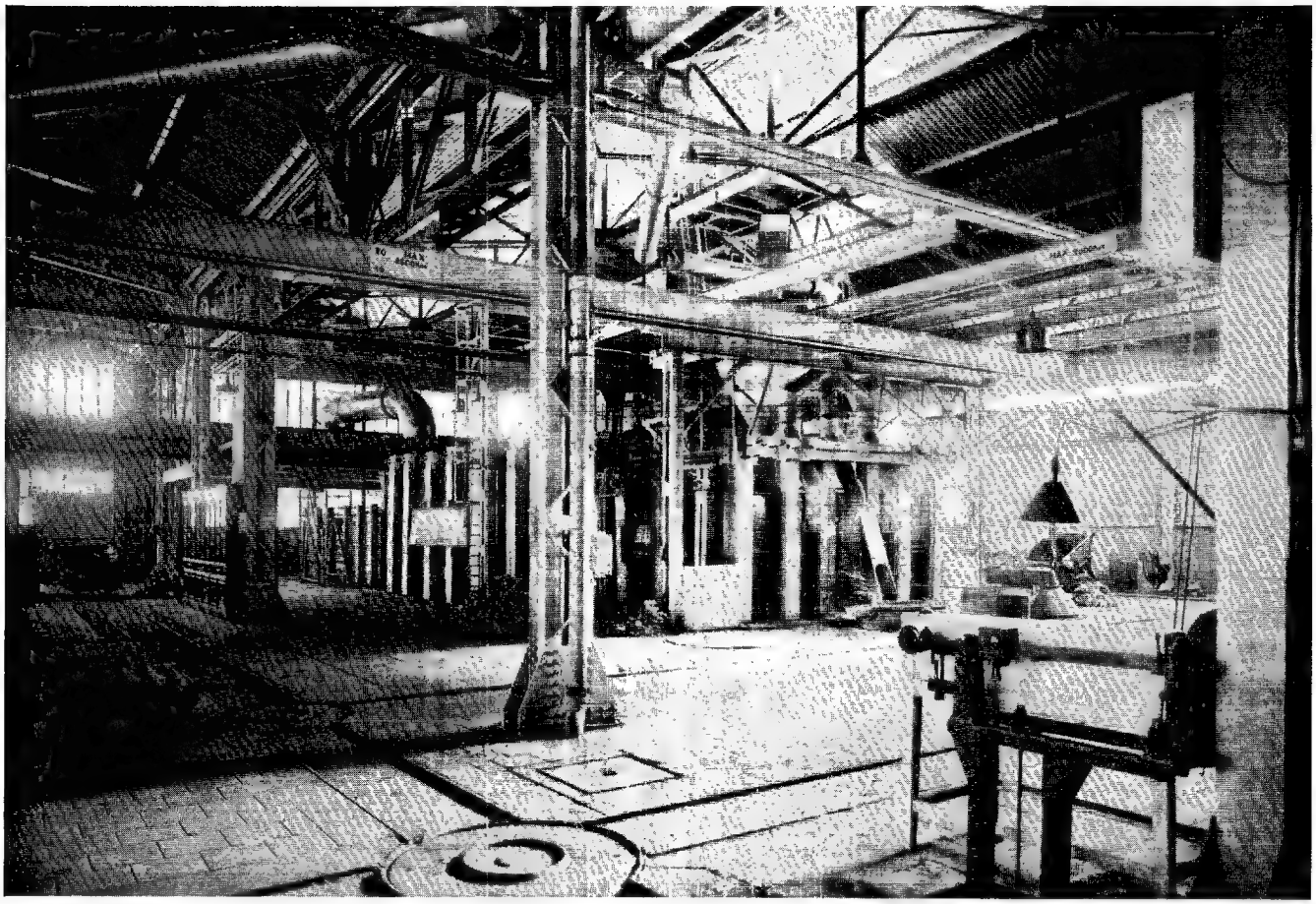
The capital of "Minoteries du Katanga" is 24 million francs.

Minoteries du Katanga. Kakontwe plant. The Kakontwe and Elisabethville plants of this company primarily produce high-quality corn and cassava flours for supply to the native workers and their families. The residual oil-cakes supply food for livestock and are greatly appreciated by the Katanga breeders.





The Luena Collieries supply the Katanga with a grade of coal suitable for boilers and certain types of furnaces but it cannot be made into coke. The mines are open-pit mines.



Hoboken plant. Treatment of tin ores. This plant treats the greater part of the Belgian Congo tin concentrates. It has a capacity of 9,900 tons of tin per year.

phured and sintered before undergoing the following treatments.

BLAST FURNACES

The blast furnace section consists of five water-jacket type furnaces and has a total capacity of 1,020 tons every 24 hours. The charges produce a matte containing 40 to 45 per cent copper, lead and an arsenical speiss.

CONVERTERS

The copper mattes produced in the water-jacket furnaces are treated in Pierce-Smith converters. The copper so produced analyzes 98 to 99 per cent purity. It is then sent to the Oolen plant for refining.

LEAD REFINING

After the removal of copper, tin, iron, nickel, arsenic and such other impurities as may exist, and all of which except the iron are recovered later, the lead produced in the water-jackets contains only silver, gold and platinum which are collected in the form of an alloy for treatment in the Precious Metals Division. The pure lead is then cast into ingots of 50 kilos called salmons.

The average capacity of these facilities is about 40,000 tons per year.

TREATMENT AND REFINING OF PRECIOUS METALS

The Precious Metals Division, in addition to treating the residues received from the Lead Division, also treats all the crude gold shipped from the colony as well as the electrolytic muds from Union Minière and the Oolen refinery. All these products are subjected to a series of melting and electrolytic treatments, in the course of which the silver, gold, platinum and palladium are separated in their pure state.

Capacity in this case is 21 tons of gold and 300 tons of silver per year.

TREATMENT OF TIN ORES

The greater part of the Belgian Congo concentrates are sent to the Hoboken plant Tin Division for treatment. They are melted in a reducing atmosphere in a reverberatory furnace. After melting, which eliminates the iron and copper, the crude tin passes into a casting tank from which it is cast into high-purity ingots.

Capacity is 9,900 tons of tin per year.

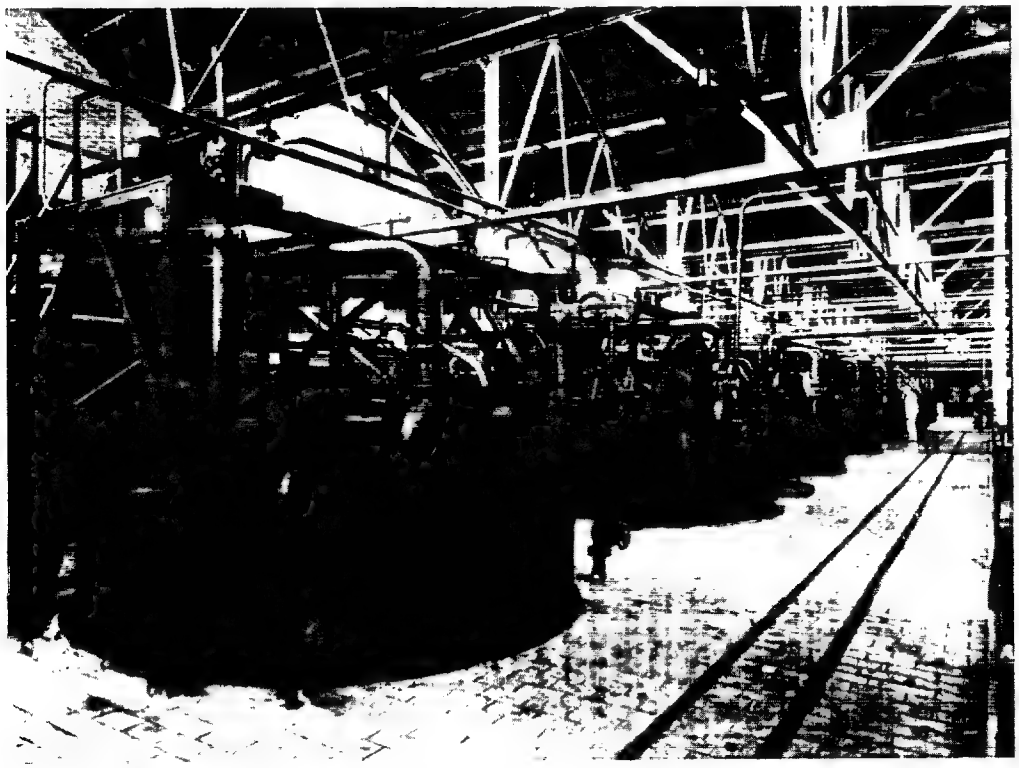
SULPHURIC ACID

Sulphide ores constitute an important part of the raw materials treated at Hoboken.

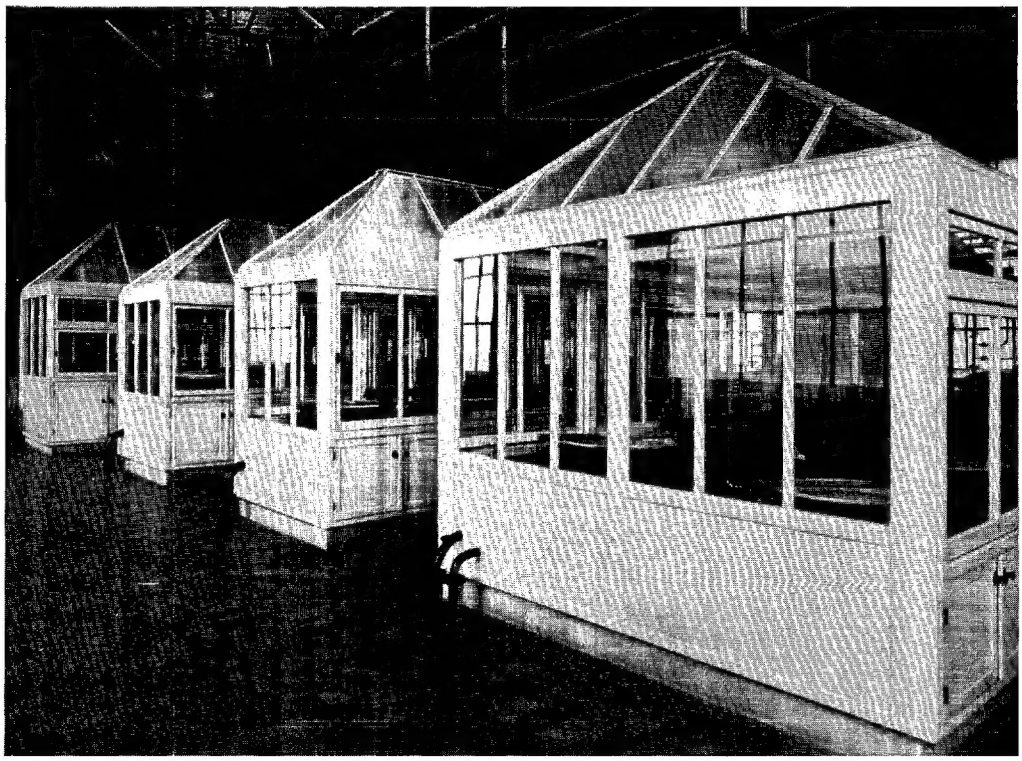
Prior to their treatment in the blast furnaces, these ores, as has been noted, undergo a roasting and sintering treatment.

The recovered sulphurous gases serve, after dust removal, for the production of sulphuric acid. The Petersen Process employed in this plant offers the advantage of considerably reducing the congestion which would otherwise result from using other process under the same conditions.

During the last few years, the production of sulphuric acid has been increased to 130,000 tons per year.



Oolen cobalt plant. This plant treats the cobalt alloy shipped from Katanga by Union Minière. It has a capacity of 2,000 tons of cobalt a year.



Oolen. Radium plant. Fractional crystallisation. This plant treats the radium-bearing ore and sludges originating from the African mines.

OOLEN PLANT

Located on the canal which links the Scheldc and Meusc Rivers, about 13 miles from Turnhout, the Oolen plant built after the first World War, for the most part treats the products shipped from Africa by Union Minière. This plant, covering an area of about 114 acres, consists of separate copper, cobalt and radium refineries, representing its principal activities. Its personnel numbers 32 engineers and 1,500 workmen.

ELECTROLYTIC COPPER REFINERY

The Oolen electrolytic plant, completed in 1927, relies for its main activity on refining the copper shipped from Africa by Union Minière. It also refines the copper produced at Hoboken as well as copper of various origins. The copper is cast into soluble anodes which are then refined by a process similar to that in use at Union Minière's Shituru electrolytic plant. The annual capacity of this plant is 120,000 tons of refined copper.

COBALT PLANT

The cobalt plant, which annually produces some 2,000 tons of refined cobalt, was built in 1923. It treats the cobalt-alloy shipped by Union Minière from the Katanga. After crushing, the cobalt is processed for the removal of iron and copper. The latter is then sent to the refinery. The cobalt in solution is precipitated as cobalt carbonate which is calcined to form cobalt oxide. This oxide is then pelleted and reduced in a furnace in the presence of charcoal. This results in the production of metallic cobalt in the form of rondelles which, before sale, are polished in a revolving drum.

RADIUM PLANT

The radium plant treats materials also supplied by Union Minière. The process consists in chemically separating the radium and the barium from other elements. These two metals are subsequently separated from each other by fractional crystallization. The final product is a high-purity radium salt.

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However detailed the foregoing descriptions may be, they give but an incomplete idea of the important tasks which the Belgians have undertaken in order to reap for the general welfare the mineral wealth of the Katanga province. It gives but a feeble notion of the rapidity with which this once isolated region of Central Africa is being developed.

We nevertheless hope to have conveyed to the reader an outline of the solutions being given to the various problems which have to be met in the Belgian Congo with the aim of promoting its social and economic life.

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